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CARCINOMA OF THE MALE BREAST.*

By Louis M. Warfield, M. D.,

House Medical Officer, The Johns Hopkins Hospital.

Although carcinoma of the male breast is not a very uncommon occurrence, it is of sufficient rarity to justify a few remarks on the subject with a review of the cases published in the literature in the past ten years.

Naturally a number of explanations have been offered to account for the relative rarity of this condition in men as compared with women, and the one most generally accepted is that it is due to the inherent difference in the function of the gland in the two sexes. In the first place the female mamma is more apt to be injured for obvious reasons, and in the second place it passes through a series of changes tending to make it susceptible to new growths of all kinds. Up to the time of puberty the gland is quite similar in the two sexes, but from that time the course of one is, if not regressive, at least stationary, with a poor blood supply, while in that of the other there is growth of all the ducts and acini with consequent greater vascularity. Then, too, at every pregnancy the breast proper proliferates, the gland functions during lactation, and after the child is weaned the mamma goes through a series of regressive changes, becoming more and more fibrous, until after the menopause, very little of the true gland tissue remains. However, carcinoma of the breast in both sexes has its origin in the gland epithelium, whatever view one holds as to its etiology, and it is a well known fact that a growth may exist as a small, painless nodule for years, and suddenly take on malignant characters. This Imbert,[1] thinks is due to the rupture of the surrounding capsule, thus giving an exit for the further growth and invasion of the tumor cells.

According to Eliascheff,[2] the first man who recognized a mammary cancer in the male breast, was Thom. Bartholinus (1616-1680). Then later J. Muratt and Gottfried Bidloe, both of whom lived in the 18th century, saw and described cancers of the male breasts. The literature of the present dates from Poirier's[3] thesis (1883), and this together with Schuchardt's careful analyses in the "Archiv für Chirurgie"[4] form the chief sources of our knowledge of this condition.

Up to 1890 Schuchardt had collected from every source and tabulated 472 cases of carcinoma of the male breast. He carefully reviewed all the literature and made elaborate statistical researches, particularly with regard to the relative frequency of occurrence in the sexes and the relation of deaths due to this disease per 1000 of population in the large cities of Europe. These statistics are so full that I shall not review them, as the original articles are readily obtained. Williams[5] in 1889 reported 100 cases, but as he did not give the sources of his statistics, it is probable as Schuchardt remarks, that some cases were reported twice.

I have collected up to the present time the cases reported

*Read before the Johns Hopkins Hospital Medical Society, March 4, 1901.

since 1890. I could find but 32 cases. To these I shall add 5 cases reported for the first time, 4 occurring in the Johns Hopkins Hospital, and 1 case I observed with Dr. T. P. Waring, of Savannah, Ga.

As to the relative frequency of this affection in the two sexes, statistics vary at times considerably. Thus, Schuchardt gives percentages from 1.6 to 8.4, obtained from various clinics. Bryant says cancer in the female is 100 times as frequent as in the male. Williams found it 117 times as frequent. In this hospital, between the years 1888 and 1901, there were admitted, on the surgical side, 307 cases of cancer of the breast, of which 3 were in males. 1 case was admitted to the medical wards. In St. Thomas' Hospital Reports (England) for the years 1891-1899 inclusive, there were 287 cases of cancer of the breast, 2 of which occurred in males.

Age.—In my series of cases the age of the patients was given in 36 cases. The majority, 25, occurred between the ages of 40 and 70. The youngest was 12 years (Blodgett [6]), the oldest 91 years (Lunn [7]). The greatest number occurring in any one decade was 13 in the 7th decade. This is somewhat later than most statistics give, the 5th and 6th decades seeming to be the time when cancer is most prone to occur.

Length of time the tumor was noticed.—The longest time was 35 years (Owens and Eisendrath [8]). The shortest time 2 weeks (Moore [9]). The former was the case of a merchant aet. 56, who was seen in 1898. Since 1863 he had noticed a slight depression of his right nipple, and a small swelling, the size of a pea, in the breast. This lump did not increase in size until 1897, when a small scab formed on the nipple, which, when removed, left a bleeding surface. No history of trauma. From that time the tumor steadily increased in size. In the other case there was a history of a blow 4 months before patient was seen. Six weeks after he was struck on the breast, a small painless lump appeared in the right breast. This gradually increased in size. At operation the whole breast was removed and the microscopical examination showed it to be a carcinoma.

Affected breast.—Either breast may be affected indifferently. Some statistics show that the left breast is more often the seat of tumor, others the right breast. Thus in Sengensse's paper he gives the following: Left breast, 17 out of 30 cases (Horteloup); 23 out of 37 cases (Poirier). In Williams' cases out of 71 there were 38 in which the right breast was affected, and Imbert [10] gives 64 on the right side to 48 on the left. In my 37 cases, 18 occurred in the right breast and 18 in the left. In one case (Sinha [11]) it was not stated which side was affected.

Trauma.—Out of the 37 cases, in 8 cases there was a definite history of injury to the breast at some time previous to the development of the tumor. No history in 4 and in 25 no statement was made as to trauma. Two cases were apparently caused by the irritation of constant friction. One, a shoemaker, æt. 91, who noticed that his braces rubbed his breast and made it tender (Lunn), and the other a patient, æt. 70, with a similar history (MacLaren [12]). One case (Imbert [13]) was thought to have developed cancer from the wearing of a heavy watch over the right nipple. Schuchardt gives 25 out of 219 cases due to contusion or other mechanical cause.

Imbert [14] says that he often found in those males who have cancer there is abnormal development of the breasts. In the case he reports the patients' breasts were much larger than normal. He thinks there is a relation between hypertrophied breasts and cancer. In none of the other cases was any mention made of enlargement of the breasts other than that due to the tumor itself.

Pain.—Pain was not a prominent symptom in the cases. It was noted only 9 times. In several it was of a lancinating character, and in one case described as gnawing. In 5 cases it was stated that there was no pain. I think we might assume that where pain was not a symptom nothing was said about it, and we can then take the remaining cases, 23 in number, making 28 cases in which there was no pain.

Ulceration.—Ulceration was given in 13 of my cases. In Schuchardt's series of 219 cases, in 70 it was stated whether or not ulceration occurred, ulceration being present in 61 cases. In nearly every case where the tumor had remained latent for a long time, some irritation caused its rapid enlargement with, at times, ulceration. Imbert says that ulceration is commonly preceded by the tumor's becoming adherent to the skin. This is thinned, becomes purple and enlarged veins are seen upon the surface. This is illustrated in all the cases reported that ulcerated. Those cases in which the skin over the tumor was described as being thin, purplish, etc., were undoubtedly seen soon before the ulceration of the tumor.

Retraction of nipple.—Retraction of the nipple was noted in 12 cases. In 18 cases the nipple was involved. In one case the nipple was totally destroyed (Case II), in another case only part was gone (Mussey [15]).

Discharge from nipple.—This was noted once. In 91 of Williams' cases there was discharge in 7. It was sanious in 4, puriform in 2 and lactiform in one. In the female, Gross [16] gives 15 out of 207 cases. In 3 cases the nipple was noted as normal. In one of these cases (Powell [17]), although the tumor was quite near the nipple, the latter was not involved.

Enlarged axillary glands.—Out of 29 of the 37 cases the axillary glands in 20 were enlarged and palpable. In one case of 6 months standing, there were no glands felt. In one that had been noticed for 9 months there was one gland enlarged just at the anterior border of the axilla.

Macroscopical appearance.—There was nothing particularly interesting in the gross appearance of the tumor. The crater-like ulcer, with hard everted edges was described twice. The tumor was always described as hard, at times as "stony" hard. The size varied from a small lump that one could just feel, to a large, ulcerating swelling the size of an orange.

Microscopical appearance.—The microscopical appearances of the tumors in both sexes are quite similar. Thus far no peculiarities of structure in the male cancers have been made out. If we accept, for convenience, Billroth's classification of carcinomata of the breast [18] into (1) acinous; (2) tubular; (3) atrophic or scirrhus; (4) gelatinous, we find that the majority of the male cancers are of the tubular type or, as he calls

them, carcinoma simplex. Mr. Marmaduke Sheild states that the usual type of cancer of the male breast is the hard spheroidal acinous variety. These would appear to be contradictory statements, but on close examination the difference is only in the nomenclature, which seems at present to be in a chaotic state. In Williams' statistics [19] he found out of 100 cases 88 were of this type. 3 were classed as encephaloid; tubular, not in the sense in which Billroth classifies tumors, but the cylindrical-celled duct cancers, 6. He also found 3 squamous celled epitheliomata and one he calls melanotic. He states that the cylindrical-celled duct cancer is relatively more common in men than in women, while Lunn,[20] commenting on his case, remarks that this variety is very rare.

Of the 37 cases a microscopical examination was made in 26. Of these, 5 are called simply carcinomata. Of the remaining 21 cases, 2 were cylindrical-celled duct cancers, 11 were classed as scirrhus cancers, the descriptions in the main coinciding with that of Billroth's tubular variety or carcinoma simplex, 7 alveolar (Billroth's acinous type). Three of these were medullary cancers. Four of my cases examined under the microscope were carcinomata simplices, although the clinical history in one was very suggestive of a true scirrhus (Case III).

Operation.—34 cases were operated on. Of the 3 remaining, one (Murray [21]) was too extensive for removal and the other two, Case IV and one of Delacour's [22] cases, refused operation. All of the patients operated on recovered from the immediate effects of operation, except in the case reported by Lunn of the old man who, a few days after removal of the tumor, died from "hypostatic congestion of the lungs." In Mussey's [23] case, 10 months after operation the patient was quite well. The boy, 12 years old, (Blodgett) was well 5 years after removal of the growth, which was a "typical carcinoma and had invaded all the visible gland tissue of the breast." Boelhagen,[24] who reported in his Dissertation 11 cases, followed up the course of events in 10. Three of these died. One died 3 years after operation, whether from a recurrence or not, was not known. The other two died of recurrence, one 1 year after operation, the other 5 years after. In both of these cases only a portion of the pectoralis major muscle was removed, although in the former there was a macroscopical growth in the substance of the muscle. The axilla was thoroughly dissected out and all glands removed in both cases. Of my 5 cases the results are known in 4. Two died; one 1½ years after removal (see Case III); the other 1 year and 5 months after operation (see Case I). The other two cases are at present well, but the operations were done comparatively recently (8 months and 3½ months ago), so nothing can be inferred from them.

A most interesting case and one showing a not infrequent sequela of cancer of the breast occurred in this hospital. This case I shall report in full, as there was a careful autopsy made, as well as microscopical sections of the original tumor and metastases.

Case I.—W. L. C. B. Surg. No. 8117, æt. 47, was admitted September 15, 1898, complaining of tumor of the left breast. Family and past history have no bearing on the case. His trouble he dated back 26 years, when he was 19 years old. At that time he slipped on a fence and struck his breast. About a month later he noticed a lump about the size of a pea which gave him no pain or inconvenience, gradually increasing in size, until 3 years before admission the tumor took on a much more rapid growth and began to spread out. In the summer of 1897 he accidentally cut it with a suspender and noticed then that the growth was flattened out and about the size of a silver dollar. The tumor steadily grew larger and was sore when struck or handled roughly. In the winter of 1897 he noticed for the first time a lump in the axilla the size of end of thumb, which grew gradually to size of walnut without giving him any pain. He saw also that the nipple was being retracted and the skin over it was adherent. There was no discharge from the nipple, when the tumor was cut; only blood came from it. Patient had lost about 10 pounds and felt that he was becoming weak.

Physical examination showed him to be a fairly well nourished man. Occupying the nipple region and left areola was a disc-like stony hard growth measuring 2.5 x 3 cm., with a slightly scalloped, distinctly elevated, sharply defined margin. Radiating out from this in skin were fine purplish venules. The nipple was flattened out and retracted, and the growth projected about 2 cm. above skin level. The skin over most of the tumor was glistening and parchment like. The axilla was a contracting metastasis, and 3 or 4 small glands could be felt between it and the tumor. The pectoralis major muscle seemed drawn together and flattened out, although the tumor and metastases were movable on the deep structures.

Complete operation, including excision of the glands in the neck was done under ether Sept. 21. Axillary flap to cover axilla and skin graft to cover chest wall. The skin grafting took well and wound healed per primam, except for a small slough at lower angle of axillary flap. Patient was discharged well Oct. 2.

On Oct. 18 patient returned complaining of considerable pain in the epigastrium and around the xiphoid, shooting along costal margin to each side and coming on in paroxysms, at times so severe that he was kept awake the greater part of the night. His pain had no relation to the taking of food, he had no nausea or vomiting, nor was there any marked loss of appetite or strength. He complained of no pain in the wound. The area where the slough was, was covered over in great part by healthy granulations. He remained in the hospital until Oct. 23, when he was discharged improved, although there was still some pain along the costal borders.

He returned again Nov. 3 complaining of similar pains and stiff back. He remembered that a month before operation he had had some pain in his lower right axilla, passing to ensiform cartilage. Now, however, he was suffering from girdle pains of a shooting but sometimes burning or aching character, along the course of the 9th and 10th ribs. The rigidity of his back was noticed for 2 weeks and was gradually growing worse, so that he could not stand on his feet for long

nor could he stoop. On examination there was marked rigidity of the spinal muscles, but no curvature or deviation of the spine. At his own request he was discharged Nov. 5.

Again patient returned Feb. 6, 1899, complaining of the girdle pains and trouble with his bladder. The attacks of pain would come on in acute paroxysms, forcing patient to double up with knees on chest.

Now began the onset of his paraplegia, with stiffness in the left knee and a feeling in the soles of his feet as if he were walking on cotton.

On examination there was seen prominence of the 6th to 9th dorsal vertebrae with a small, red fluctuating, very painful mass about the size of an almond at the level of the 8th spine.

Patient now became gradually worse. He had dribbling of urine from an overdistended bladder and was troubled with priapism. It was necessary constantly to catheterize him. There was almost complete paresis of his legs which became complete shortly before death. There was also some dulling of sensation to pain and touch over lower legs anteriorly. His pain was so intense that chloroform was constantly administered. The prominence of the dorsal spines became more marked and there was also distinct enlargement of the spines.

Patient gradually sank. He became delirious and coprolalic. At no time were his arms affected. The deep reflexes in his legs which had at the onset been present with later development of ankle clonus, were completely lost. Bedsores developed over sacrum and heels and he died February 27, 1899. At autopsy there were no metastases to the internal organs, but portions of the sternum, ribs and vertebræ were the seats of metastatic deposits. These growths filled the interior of the bone, leaving only a surrounding thin shell of bone, and on section were composed of dark purplish masses in which spicules of bone were seen. The consistency was semifluid. The spinal cord was removed and revealed on the anterior floor of the canal a mass directly over the 7th dorsal centrum. This mass was somewhat saddle-shaped, measuring 2 cm. long and 1.5 cm. broad, extending almost across the canal, projecting into it and causing a well marked compression of the cord. There were several other small nodules above and below this projecting into the canal, but they probably exerted no pressure on the cord.

At the point where the tumor encroached on the cord there was a definite compression with softening and narrowing antero-posteriorly to about one-half thickness of adjoining portion.

Microscopical sections were made from the original tumor, from a nodule in one of the ribs, from the mass along the spine, axillary and bronchial glands and from the mass projecting into the spinal canal. Section of the breast shows a tumor composed to large extent of connective-tissue stroma with the tumor cells scattered in groups here and there. Some areas show spaces lined by one or more rows of epithelial cells which appear as cross sections of tubes having definite lumina. In other areas are strands of cells, while in other parts dense masses of cells are seen which have in many places shrunk away from the surrounding connective-tissue wall. In some parts of the sections are seen large masses of cells having the typical vesicular nuclei and relatively large amount of protoplasm with very little connective-tissue stroma. Everywhere, especially at periphery of tumor, is seen round-cell infiltration. Sections through the pectoral fascia and muscle show the former is infiltrated with the tumor cells but the latter contains none.

Several axillary glands were studied and metastases were found in some. Sections from a bronchial gland show cells similar to those of the primary tumor arranged in acinous forms. There is very little connective-tissue stroma. At the periphery of the nodule the tumor cells can be seen infiltrating the gland substance.

Sections of the marrow of a rib and a diseased vertebræ and from the mass along the spines show dense infiltration with the tumor cells.

A section from the growth in canal is seen to be composed entirely of cells similar to, but smaller than, the original tumor cells, and connective tissue strands separating these cells into alveolar-like spaces. Microscopical diagnosis, carcinoma simplex.

Case II.—D. M., Surg. No. 10,721, æt. 71, admitted July 29, 1900, complaining of swelling of breast. Family and past history negative. 16 months before admission he noticed a lump on the right nipple which grew to the size of a strawberry, which was removed with cancer paste and he thought himself cured; 2 months later the growth returned and progressively increased in size. He suffered with stinging pain which kept him awake at night. Since his illness he had lost 40 pounds in weight.

Physical examination showed patient to be a large, corpulent man. Occupying region of right breast was a tumor projecting 4 cm. above the chest wall, oval in shape 5 x 7 cm., with ulcerated surface and having a foul odor. The tumor completely surrounded the nipple area and the nipple itself had disappeared. Skin around it was tense and red, tumor was not very hard or tender and was not adherent to underlying structure. Enlarged glands in axilla. Operation was performed consisting of complete removal of the breast together with both pectoral muscles and a thorough dissection and removal of the glands in the axilla and lower part of neck. Patient made an uneventful recovery and is at present well.

Sections from this tumor showed pictures quite similar to those from Case I except that the tumor was more cellular. Numerous mitotic figures were seen. One could surely say from these sections that this tumor was of an exceedingly malignant character. A section from the subjacent muscle shows metastasis. Scattered throughout the tumor were areas of hyaline degeneration of the cells. Several glands were examined but no metastases were seen. Diagnosis: Carcinoma simplex.

Case III.—P. S., Surg. No. 2628, æt. 64, admitted November 14, 1893, complaining of swelling in left breast. 20 years before he sustained an injury to the breast which made it

always painful and tender. 5 years later he noticed a lump near the nipple. During two weeks before admission the swelling had increased rapidly and was tender on palpation. The nipple was retracted and the skin over the tumor was adherent to it and was dimpled and reddened. Nodule was also adherent to fascia beneath. Tumor was situated in inner and upper quadrant, measured 1.5 x 2.5 x 1.75 cm. Axillary glands palpable.

Operation November 16. Breast with pectoralis major muscle and axilla removed "en masse." Patient did well and was discharged cured. He returned November 8, 1894, with nodules over site of old scar and a few palpable glands over right clavicle. These were removed under cocain and patient discharged well. Patient did well until spring of 1895. Then he gradually became weak and lost flesh and strength. No pain or discomfort. He had no sensation of hunger and ate very little. There was no dyspnœa, no pleural pain. He became weaker and weaker and swallowing was almost impossible. A distinct nodule was felt at this time in abdomen below costal margin. He died in May, 1895, 1 year and 6 months after operation. Autopsy showed carcinomatous nodules in all the internal organs and in the lymph glands. At the cardiac end of the stomach were a number of nodules. Along the lesser curvature these had produced a stricture at the cardiac orifice. No metastases to the peritoneum.

Sections from the tumor, glands and nodules removed from the skin showed picture resembling that of Cases I and II. The tumor cells were arranged in larger areas and there was very little stroma substance in one section of a lymph gland. Diagnosis: Carcinoma simplex.

Case IV.—Full notes of this case were lost. I am indebted to Dr. Osler for the following facts. E. S., æt. 40, was admitted to Ward C with a history of severe girdle pains and pains in the legs for several months. When seen he was rapidly becoming paraplegic, had a great deal of pain and had lost much weight. In the right breast he had a well marked scirrhus tumor, which had not previously been recognized, and which had given him no trouble. He refused operation.

Case V.—I saw this case with Dr. Waring December 22, 1900. M. G., school teacher, æt. 50. For a number of years he had been suffering with a form of nervous dyspepsia. Patient said he did not know how many years he had had a lump in the left breast. He thought he had injured the breast before he noticed the tumor. It had begun to grow rapidly in last few weeks. He had occasional sharp pains in the breast and the tumor was very tender on manipulation. The tumor was situated in upper and outer quadrant. The nipple was retracted. The tumor was about the size of a walnut and was firm, hard, and slightly nodular. It was adherent to the skin but could be freely moved over the deeper structures. No axillary glands palpable.

Operation consisted in removal of tumor and subjacent pectoral fascia by an elliptical incision. The pectoral fascia was infiltrated for some distance from tumor. Wound sutured. Healing per primam. Patient is at present well.

Microscopical sections were made and examined. The pictures corresponded to those seen in sections from Case I, so that description will serve here. The pectoral fascia in this case was infiltrated with the new growth.

Finally, there is practically no difference between the condition in the two sexes. The clinical symptoms are quite similar, the pathological findings are alike and thus far the microscopical examinations of the tumors removed from men and women have shown no difference in structure.

All the varieties found in women are found in men, but it appears that the atrophic scirrhus carcinoma is much more common in women. The figures also show that in men the nipple is more apt to be involved, possibly because the gland is so small that any growth must of necessity be near enough to the nipple eventually to cause its retraction. Ulceration would appear to be more common in men, while discharge from the nipple is relatively more frequently seen in women (Gross, 15 out of 207 cases). Pain, while at all times a variable symptom, is not so great in male as in female cancer (Imbert), although it can be of an excruciating character as seen in several cases reported in the literature.

It is interesting to note that in my first case, although there were many metastases in the bones, none of the organs were affected, whereas in another of my cases (Case III) autopsy showed carcinomatous deposits in all the organs with a nodule at the cardiac end of the stomach, causing stenosis of the orifice. The bones in this case unfortunately could not be examined but it is probable from the history that they were free from metastases. In still another of my cases (Case IV) the patient came to hospital complaining of girdle pains in the legs which for several months had been severe. He was rapidly becoming paraplegic and had lost much weight. He did not know he had a tumor of the breast, which was found on making the physical examination. It is within reason to suppose that he had a condition similar to my Case I, with metastases in bone but none in the internal organs.

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REPORT OF A CASE OF CARCINOMA DIAGNOSED BY MEANS OF PARACENTESIS ABDOMINIS, WITH SOME REMARKS ON THE DIAGNOSTIC VALUE OF EXAMINATIONS OF SEROUS EFFUSIONS.

By Walter Ralph Steiner, A. M., M. D., Hartford, Conn.

Formerly House Medical Officer of the Johns Hopkins Hospital.

The following case is reported because of the accidental method of diagnosis.

Fannie C., negro, aged 63 years (Hospital No. 25,015), was admitted to the Johns Hopkins Hospital, December 15, 1899, complaining of pain and swelling of the stomach.

Family history.—Negative.

Past history.—Measles and chicken-pox as a child. Small-pox thirty-seven years ago, having contracted it during an epidemic of this disease in Baltimore. About thirty years prior to admission to hospital she had some ill-defined womb trouble, for which she received treatment. Denied syphilis. Was generally a moderate beer and whiskey drinker, but at times had drunk to excess.

Present illness.—During July and August, 1898, she noticed her "stomach" would swell after eating but would go down again in an hour or two. This continued daily until about eight weeks ago when she observed the swelling did not decrease in size but kept constantly growing larger. About this time, also, she began to complain of sharp pains in the pit of her stomach. They would frequently radiate to the back and obliged her to stop work. Since then she had suffered a good deal from coughing and shortness of breath. Both were aggravated by exertion, so she had spent most of her time in bed or sitting up in an easy chair.

For six weeks past she had had a burning dull pain, from umbilicus down to pelvis, just before micturition. Apparently there was no increase in frequency or in the amount of urine voided. She was, as a rule, constipated and frequently had to take remedies for it.

For two weeks she had noted a slight white, non-irritating, vaginal discharge—the first since her menopause, eighteen years ago.

Physical examination.—The patient was a well developed, well nourished mulatto woman. There was no cyanosis, no respiratory distress and no cough during examination. The lips and mucous membranes were of good color. The tongue was tremulous and coated with a thin white fur.

Thorax somewhat barrel shaped. Respiratory movements fair and equal. Costal angle normal.

On palpation the vocal fremitus was diminished in the lower right axilla and over the lower left lobe in the back. It was absent over the lower right lobe behind. On percussion the note was impaired where the vocal fremitus was diminished and there was slight movable dulness in the right front. Over the lower right back the note was quite dull. On auscultation the breath sounds were enfeebled where the note was impaired and fine and coarse moist râles were here heard. The breath sounds were absent on the lower right back and the vocal resonance here had a nasal quality.

Heart not enlarged. A soft systolic murmur was heard at the apex, which was not transmitted upwards or outwards. The pulmonic second was somewhat accentuated. Pulse 94 to the minute, regular in force and rhythm, and of good volume and tension. Arteries not thickened.

Abdomen very much and symmetrically distended. The veins in the lower quadrants were quite prominent and swollen. The costal and iliac grooves were absent. There was marked bulging of the flank lines and also of the dependent parts on changing position. On palpation fluctuation was easily obtainable. On percussion there was dulness in the

dependent parts, with movable dulness when she changed her position.

Extremities.—Feet and legs were very œdematous and pitted easily on pressure.

On December 18 a vaginal examination was made by Dr. Hunner with negative results. The note does not state whether the ovaries were palpated.

The day following, patient's abdomen was tapped, the trochar being inserted in the median line, midway between umbilicus and symphysis pubis. 8000 cc. of a dull red fluid were withdrawn (see Chart I. for this and subsequent tappings). After the tapping Dr. Futcher made the following note: "For the past two nights patient has had some rise of temperature. On December 18, her temperature was 102° at 8 p. m., and on December 19, at the same hour, it had risen to 103.2°. She has had no distinct chill.

"The abdomen is still markedly distended. The costal and iliac grooves are symmetrical. There is marked bulging in the flanks. On percussion the note is tympanitic in the elevated but flat in the dependent portions. There is still considerable fluid in the abdomen and distinct movable dulness is obtainable. The relative hepatic dulness begins over the middle of the sixth interspace, and the absolute over the middle of the seventh interspace, and extends to a point 8.5 cm. below the costal margin in the mammary line. The total extent of absolute dulness measures 14 cm. On palpation a definite mass is felt, occupying the lower part of the epigastric and the upper part of the umbilical regions. The fingers can be distinctly placed below the margin of this mass, which extends over to the right and becomes continuous with a resistant mass in the lumbar region of the abdomen. From this mass it is separated by a more or less distinct notch, somewhat resembling the notch in the liver. The fingers can be pressed in above the mass in the epigastrium. To the left the outline of the mass is less distinctly made out, but it appears to terminate at the junction of the upper quadrant of the umbilical with the lumbar region. The surface of this mass, as well as its lower border, is very nodular and rather hard. To the right its margin is not definitely to be made out. The lower margin of the tumor descends slightly on deep inspiration but does not feel as if connected with the liver. The mass is very freely movable in both vertical and transverse directions. It seems to be separated from the abdominal wall by a thin layer of fluid. After inflation of the stomach, the mass becomes more prominent and descends distinctly. Its lower margin is now well felt 4 cm. below the umbilicus in the median line. The tumor is extremely nodular; this is more marked than before distension. The upper limit of stomach tympany begins at the sixth interspace on the parasternal line. The lower limit of stomach tympany reaches 4 cm. below the umbilicus in the median line, at the lower margin of the tumor. Over the tumor area dull tympany is obtained on percussion. There is no definite peristaltic wave to be made out. No definite glands palpable in the supraclavicular fossæ or in the episternal notch. The axillary glands are not enlarged, nor are the inguinals especially increased in size." The rectal examination was practically negative.

On the next day Dr. McCrae described the tumor as an almost continuous succession of nodular masses which were best felt on deeper dipping. He made out the total extent of these masses to be 21 cm., reaching from the right mammary to the left parasternal line. No tumor was felt in the costal angle or emerging from the left costal margin. Dr. Osler described these distinct nodular masses as separate from the stomach, which was palpable on inflation.

January 10. Patient's stools were examined for tubercle bacilli with negative results. They had been very watery and chocolate in color for some days previous. No excess of fat was made out by microscopic examination.

Three days later a blood examination gave the following: red blood corpuscles 5,608,000; white blood corpuscles 4400; hæmoglobin 68 per cent.

A few days before January 31 she had complained of pain in the right side and shortness of breath. On that day the percussion note was flat over the right lung almost from apex to base, in front and behind. The vocal fremitus was slightly exaggerated below the right clavicle, but elsewhere it was diminished. The breath sounds over the upper right front had a slightly tubular, amphoric quality, and the voice sounds throughout were somewhat diminished and of a distinct nasal quality. There was appreciable movable dulness over the first interspace. The point of maximum cardiac impulse was in the sixth interspace 11.5 cm. from the mid-sternal line. The heart's action was rather rapid, and the rhythm was suggestive of embryocardia. Later in the day the right pleura was aspirated, the needle being inserted a little to the left of the angle of the scapula, in the eighth interspace. 1550 cc. of a thin hæmorrhagic fluid were withdrawn (see Chart II. for this and subsequent aspirations). The point of maximum cardiac impulse as well as where the sounds were best heard could not be well determined after this aspiration. They seemed to be well within the measured spot given above.

Feb. 18. *Blood examination.*—Red blood corpuscles 4,522,000; white blood corpuscles 14,000; hæmoglobin 58 per cent. Five days later she complained of passing a considerable quantity of blood in her stools. From this time on her condition gradually grew worse. On March 13 an emphysematous condition of the abdominal wall was noted, and the œdema here and in the extremities was most marked. Two weeks afterwards she began to have severe attacks of vomiting and could retain nothing on her stomach. This was relieved by tapping. Micturition now became somewhat difficult and she was only able to void very small quantities of urine at one time.

April 7. *Blood examination.*—Red blood corpuscles 4,476,000; white blood corpuscles 10,000; hæmoglobin 60 per cent. Differential count:

Polymorphonuclears	82.
Large mononuclears and Transitionals	7.5
Small mononuclears	10.
Eosinophiles	.5

About this time she began to expectorate very profusely. The sputum was clear, watery and frothy in character, with a slight whitish sediment. No tubercle bacilli were found on examination.

On April 10, on putting the trochar through the canula, after a tapping, a small piece of tissue, 5 x 1 mm., was noticed at the end of the trochar. It was white in color and looked very much like fibrin. Thinking, however, it might be of some diagnostic import, we hardened it in alcohol and finally imbedded it in celloidin. The sections were stained with hæmatoxylin and eosin. Their examination will be later mentioned.

The patient grew gradually weaker and became somewhat emaciated. During her last month she was obliged to remain in bed. Dr. Futcher made the following note on May 22: "Patient's temperature has been gradually falling during the past four days. This a. m. at eight it is 96. Pulse is irregular and extremely weak, almost imperceptible, 25 to the quarter. Owing to fulness and distension of the abdomen it is practically impossible to make out the mass, which has been felt, except in the epigastrium a sense of resistance is encountered. The œdema of the abdominal walls is considerable. There is flatness over the right lung as high as the third interspace, above which the voice sounds are harsh and exaggerated. The respiratory murmur below is feeble, distant, and of a suggestive tubular quality. The apex beat is in the fifth interspace, 2 cm. inside the mammary line. The heart sounds are well heard at apex and base. There are no endocardial murmurs. The second pulmonic is accentuated."

The week before her death she failed very rapidly. She died on May 27 at 7.15 a. m.

Urine.—On entrance the urine was dark amber in color, cloudy, 1025 in specific gravity, acid on reaction, negative for sugar and albumen. There was a heavy, grayish, flocculent precipitate. Microscopically a few hyaline and granular casts, as well as many epithelial cells, red blood corpuscles, white blood corpuscles, and mucous cylindroids. The bile test was negative. The subsequent examinations did not vary much from the above save that albumen was generally found as a trace.

Temperature.—This varied between 100° and normal till December 18, when it rose to 102° (see Dr. Futcher's first note. It fell to normal December 20 and ranged about as before till January 7, when it rose to 101°. Then it varied generally as before, but occasionally was subnormal till April 8. It rose on this day to 101.4°, but fell in two days and remained as before until May 18. From this date on it was subnormal.

CHART I.—EXAMINATIONS OF THE ASCITIC FLUID.

	I. Dec. 9.	II. Jan. 7.	III. Jan. 19.	IV. Feb. 7.	V. Feb. 27.	VI. March 11.	VII. March 20.	VIII. March 27.	IX. April 3.	X. April 10.	XI. April 18.	XII. April 25.	XIII. May 5.	XIV. May 14.
Amount ..	8000 cc.	6500 cc.	4000 + cc.	6800 cc.	6420 cc.	7000 cc.	7020 cc.	4800 cc.	10,000 cc.	8000 cc.	7020 cc.	7000 cc.	6400 cc.	5000 cc.
Color and characteristics ...	Dull red.	Reddish yellow, cloudy.	Yellowish red, cloudy.	Reddish yellow, cloudy.	Reddish green, cloudy.	Amber, cloudy.	Orange yellow, cloudy.	Lemon yellow, cloudy.	Reddish yellow, cloudy.	Reddish yellow, cloudy.	Reddish yellow, cloudy.	Reddish yellow, cloudy.	Reddish yellow, cloudy.	Reddish yellow, cloudy.
Reaction..	.....	Neutral.	Slightly alkaline.	Neutral.	Alkaline.	Alkaline.	Alkaline.	Alkaline.	Neutral.	....	Neutral.	....	....	....
Specific gravity ..	.....	1018	1019	1020	1017	1015	1014	1015	1014	....	1019	...	....	....
Sediment .	.....	Floccu-lent.	Reddish black.	Slight white.	Red, with fibrin flakes.	Red, with fibrin flakes.	Red, with fibrin flakes.	Red, with fibrin flakes.	Red, with fibrin flakes.	....	Red.	....	....	...
Albumen .	.....	2.25%	2.8%	2.5%	2.5%	3.5%	Present, a'mt not stated.	3%	1.7%	....	Present, am't not stated.	....	....	....
Sugar	.....	None.	None.	None.	None.	None.	None.	None.	None.	....	None.	....	....	....
Micro-scopically	Numerous red blood corpuscles; some leucocytes. No epithelial cells.	Numerous cells, varying in size from 1 to 4 diameters of a red blood corpuscle, mononuclear in type and containing many fat globules. The cells occur singly or in clumps.	Numerous mononuclear cells as in the second examination. Many red blood corpuscles.	Some red blood corpuscles; few leucocytes.	Many red blood corpuscles; few leucocytes.	Many red blood corpuscles; some leucocytes; fibrin.	Many red blood corpuscles; few leucocytes.	Many red blood corpuscles; few leucocytes.	Many red blood corpuscles; few leucocytes.	....	Many red blood corpuscles; few leucocytes.	....	....	....

CHART II.—EXAMINATIONS OF THE PLEURAL EFFUSIONS.

	I. January 31.	II. February 23.	III. April 12.
Amount	1550 cc.	1200 cc.	600 cc.
Color and characteristics	Yellow, cloudy with flakes of fibrin, colored red.	Blood red, cloudy.	Blood red, cloudy.
Reaction	Alkaline.	Alkaline.	Alkaline.
Specific gravity	.....	1017	1010
Sediment	None visible.	Thick red.	None visible.
Albumen	3.5%	4.5%	1.5%
Sugar	None.	None.	None.
Microscopically	Many red blood corpuscles.	Many red blood corpuscles.	Many red blood corpuscles.

Abstract of protocol. *Anatomical diagnosis.*—Carcinoma of ovary. Secondary implantations on peritoneum. Involvement of right pleura. Ascites and hydropericardium. Compression of lung. Secondary nodules in liver, intestine, etc. Obliteration of appendix by tumor mass. Myomata uteri.

Autopsy by Dr. MacCallum. Body of a large woman, 163 cm. in length. Great œdema of legs and abdominal walls; well marked œdema of left hand.

Peritoneal cavity contains large quantities of smoky, turbid fluid. Peritoneal layers are much thickened. Parietal peritoneum is roughened by a rather congested, semi-translucent, new growth. There are small depressed areas here and there resembling ulcers, the bases of which are smooth and clear; the tissues dividing these ulcer-like places are shining and scar-like in character.

Omentum drawn up into a firm mass over the level of the transverse colon and forms a transverse group of hard nodules which have a rather translucent appearance, and are studded with opaque, yellowish masses. Intestinal coils not especially adherent but serous surfaces, as well as serous surfaces of mesentery, are everywhere studded with nodular masses, varying in size from pin point to size of a bean; these have spots of opacity. There are a few adhesions between the coils of intestine lying over the fundus of the uterus and the bladder. The appendix is obscured in a firm mass of the tumors. The under surface of the liver is bound by adhesions to the stomach and transverse colon. There is great thickening of the peritoneum over the under surface of the liver. The upper surface of the liver is densely adherent to the diaphragm.

Right *pleural cavity* contains a large quantity of blood-stained fluid.

Pericardium contains a small amount of clear fluid. The pericardial layers are smooth.

Lungs.—The left pleural cavity contains a small amount of fluid. The pleural surfaces are generally smooth. Over pleura of upper lobe and upper portions of lower lobe there can be felt and seen pearly white nodules of pin-head size. The anterior portion of the left lung is air-containing. There are two nodules in the anterior edge which have a firm consistence but show no changes in color; similar nodules at base of lower lobe. On section there can be felt throughout the lung numerous, minute, firm nodules which are somewhat pigmented. These masses are œdematous and apparently contain some alveolar exudate. Surface of the lung has a rather salmon pink color and is quite moist. Bronchi are somewhat congested; blood-vessels clear.

The right lung is very much compressed by pleural exudate and occupies an area limited below to the level of the third rib. The pleural layers exhibit the same nodular appearance described in peritoneal cavity. The lung is so much compressed that the lobes are indistinguishable; the lung substance on section is, in general, air-containing and rather leathery in consistence. The lower portion is soft and has a grayish, opaque appearance. The bronchi and vessels are much thickened and are very prominent over the whole cut surface. There are no tumor nodules in the lung. The costal pleura is very much thickened by the presence of tumor nodules and has rather a hæmorrhagic appearance with a ragged surface.

Spleen is bound down to diaphragm by old adhesions which have the same translucent appearance as the nodules already described. Weight 150 grms., measures 11 x 7 cm. Capsule thickened and opaque. On section the Malpighian bodies and the trabeculæ are well seen. At hilus is a rather whitish nodule, soft, and somewhat translucent, apparently part of the tumor. Similar pin-head sized nodules occur adjacent to the vessels in the pulp of the spleen. The spleen pulp has a rather brownish red color. On stripping away diaphragm from liver the former is found to be studded with tumor nodules which often correspond with nodules on the surface of the liver.

Vagina normal.

On attempting to dissect apart the pelvic viscera neither *ovary* can be correctly outlined. The *Fallopian tubes* are distended and congested and are partly imbedded in a mass of tumor substance.

Uterus is involved from without by the tumor nodules. Its wall also contains several small myomata.

Liver.—Weight 1400 grms. Measures 24 x 19 x 9 cm. The upper surface is much roughened by the growth of tumor nodules between it and the diaphragm. There are also numerous superficial nodules. Similar nodules, reaching a diameter of 2 cm., may also be found in the substance of the liver; they are rounded, white and semi-translucent. The liver, in general, shows evidences of chronic congestion. There are some translucent nodules about pin-head size.

Kidneys.—These showed nothing, save that over the surface of the right kidney a few opaque, rather yellowish nodules were seen.

Adrenals.—The left adrenal contains several yellowish nodules which lie in the cortex.

Stomach.—There are tumor nodules in the outer wall of the stomach but the mucosa is everywhere smooth.

Pancreas.—There are small nodules throughout the surface of the pancreas, otherwise it is apparently normal.

Great omentum.—The rolled up omentum forms a mass 21 cm. long and 6 cm. in diameter; this forms the largest and firmest of the tumor nodules.

Mesenteric glands.—The mesenteric glands in general are not much enlarged but apparently contain tumor nodules.

Intestines.—The mucosa of the whole intestinal tract is apparently normal except for a few sub-mucous nodules in the ileum; one of which seems to involve the mucosa. There are also a few ulcerated patches in the colon, probably due to changes produced by the invasion of the tumor nodules. The serous surfaces are everywhere thickly studded with nodules. In the position of the appendix there is an elongated tumor mass, at the base of which there is a cavity apparently lined with mucosa. This cavity cannot be further traced into the tumor mass.

Bacteriological examination.—The cultures from the peritoneal and pleural cavities were contaminated, but from the heart's blood the streptococcus pyogenes was obtained. The examination was otherwise negative.

Histological examination.—The tumor is an adeno-carcinoma with an irregular glandular structure, the epithelial cells being arranged in several layers. Some nodules in the liver are gland-like masses, very small and lined by one row of cells; others show masses formed by cells making alveoli in the stroma. The liver also shows extreme fatty degeneration. The lung shows well defined broncho-pneumonia and anthracosis. The kidney sections show moderate diffuse connective-tissue growth and parenchymatous degeneration of the epithelium. The sections from the intestines show a sub-peritoneal tumor, as well as a nodule imbedded in the muscular coat. In the subserous tissue well defined lymphatic spaces occur, filled with tumor cells. The spleen shows evidence of chronic interstitial splenitis and contains a well defined tumor nodule.

In considering the diagnosis of this case two diseases were chiefly thought of, viz.: tuberculous peritonitis and carcinoma. If the latter was the correct diagnosis it was impossible to conjecture the primary seat of the disease, as there were no symptoms on the part of any of the abdominal organs. The stomach or the ovaries seemed to be the most likely origin.

Numerous attempts were made to obtain a test breakfast, but the patient strenuously objected to the passage of a stomach tube, so this aid to diagnosis was consequently unavailing. It is to be regretted that the tuberculin test and animal inoculations with the serous fluid were not resorted to. The age of the patient and the presence of a vaginal discharge were in favor of the malignant nature of the disease. The vaginal examination was negative. There was no emaciation until about one month before death. All doubt as to the diagnosis, however, was dispelled when the piece of tissue, removed during a tapping, was examined microscopically.

During the past century the doctrine was stoutly maintained that cancer cells were characteristic: many claimed to be able to diagnose a malignant tumor by examining the cells in a serous effusion. This theory, nevertheless, gradually lost ground, till now but few believe in it.

Dock [1] has made a valuable contribution to this subject and has shown that similar cells are found in cancerous, tuberculous, and other effusions. He, Rieder,[2] and Warthin,[3] however, claim that the diagnosis of a malignant growth may be made by the presence of many cells in serous effusions showing mitoses. These mitoses may be typical or atypical in type. The distinction is a quantitative and not a qualitative one.

In our case, though centrifugalized specimens were frequently examined and a number of stained specimens of the dried sediment made, yet in no instance were such cells seen. On two occasions (see Chart I.) large mononuclear cells were observed, but through Dock's studies, we know they can be found in ordinary serous effusions. They were probably endothelial in origin.

In fixing the sediment on the slides, besides the usual means employed, Bahrenberg [4] has used the following method: "After decanting the supernatant fluid, the addition of alcohol was followed by the changing of the more or less ropy sediment into a firm mass resembling coagulum. After a few days this material was firm and hard, and, after imbedding it in celloidin, thin sections were readily cut."

The specific gravity is an aid to diagnosis. In cancerous it is low, but in tuberculous effusions it varies between 1022-1026 (Dock). Exceptions, however, can be found to this statement for Bögehold [5] and Quincke [6] have reported cases where the specific gravity of the cancerous effusion was over 1022. In the former instance the presence of a large amount of blood might account for the high specific gravity. In our case the specific gravity of the ascetic fluid varied between 1014-1020, while that of the pleural effusion was 1010 and 1017 (see Charts I. and II.).

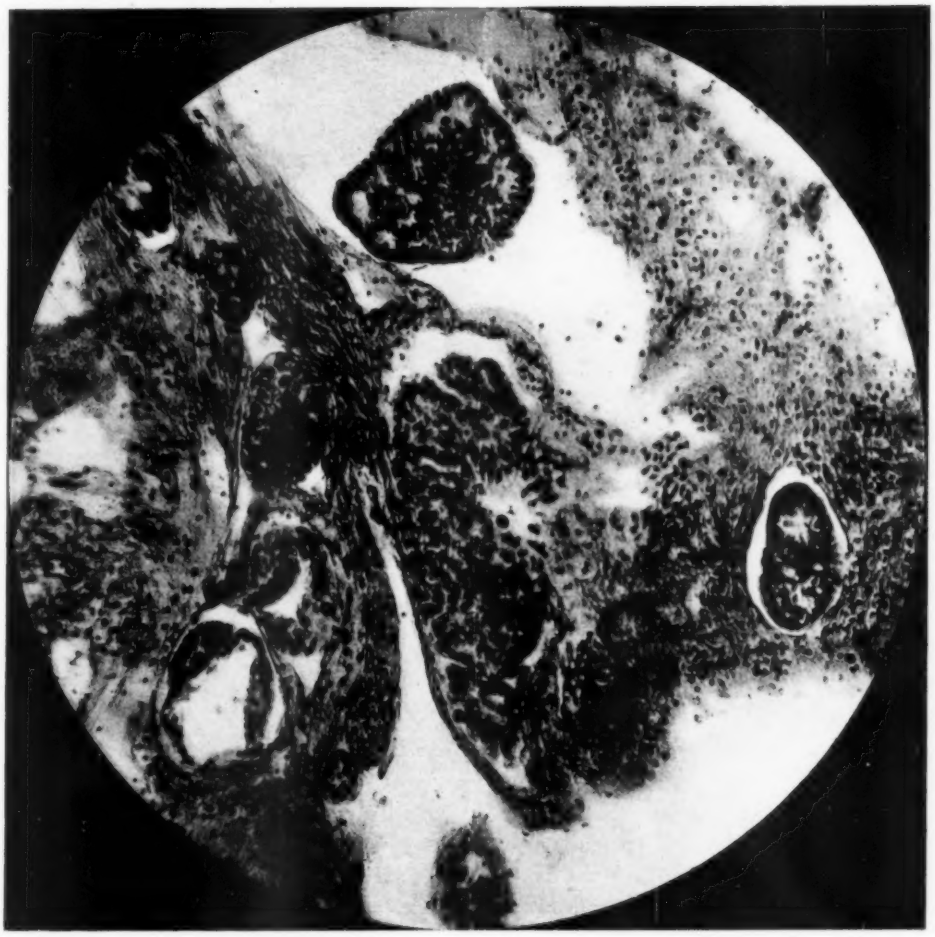
The accompanying illustration shows the microscopical appearance of the piece of tissue removed on April 10. The photomicrograph was taken by means of the Zeiss apochromatic lenses. The microscopical findings were as follows: Distinct alveoli are seen with lumina, more or less completely filled with polymorphous cells, containing large, round or oval, vesicular nuclei. The alveoli are glandular in type and their peripheries are lined by single layers of low cuboidal cells. The stroma consists of a loose meshwork of connective tissue fibrillæ infiltrated with lymphocytes. No plasma cells are seen. The diagnosis of adeno-carcinoma was made, which was subsequenfly corroborated at autopsy.

I have only been able to find four similar cases on record.

(1) Rieder [7] speaks of obtaining a small piece of tissue from the puncture opening in the abdominal wall. The case was diagnosed sarcoma carcinomatosum.

(2) Lenhartz found in an ascitic fluid a pale transparent colloid nodule which showed the alveolar structure of a colloid carcinoma of the peritoneum.

(3) Prentiss has published a case in which the right pleural cavity was aspirated, but no fluid was found. "Instead only



× 570. Objective 6 mm. Compensat. proj. Ocular No. 6. Stain haematoxylin-eosin.

blood and a quantity of substance looking like partially organized fibrin was drawn out, evidently from the lung substance." This material was found on microscopic examination to be composed of masses of sarcoma cells. The autopsy confirmed the diagnosis.

(4) Girvin and Steele have recently reported a case of "carcinoma of the pleura, diagnosed by tissue removed in tapping."

In conclusion, I desire to thank Dr. Osler for allowing me to report this case, and Dr. Arthur J. Wolfe, of Hartford, for the photomicrograph which accompanies this article.

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A CASE OF PRIMARY ADENO-CARCINOMA OF THE FALLOPIAN TUBE.

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New growths of the Fallopian tube were seldom mentioned by the older writers, and by some, primary tumors were believed not to exist. The descriptions of the early cases are so meagre that in most instances there is not sufficient evidence that the growth was not due to a metastasis from a tumor arising elsewhere. The first undoubted case of primary cancer was described by Orthmann[1] in 1888, and since then thirty-four additional cases have been recorded.

The tumor in most instances originates in the epithelium covering the folds of the mucosa and has, therefore, a well marked papillary structure. Friedenheim,[2] however, has described a case in which the tubal folds are practically normal, while the muscular coats are infiltrated with carcinomatous masses. This growth, as the writer suggests, probably originated in the gland-like structures, sometimes found in the tube walls.

Most observers are of the opinion that a close relationship exists between the development of the carcinoma and the presence of a chronic inflammatory process. It seems probable that this is an important predisposing factor, in many cases the characteristic changes resulting from an old inflammation were demonstrable and in some the opposite tube was converted into a sac containing serous or purulent fluid. The history of sterility so generally obtained and often definite attacks of pelvic inflammation tend to support this view.

Alban Doran[3] believes that carcinoma is sometimes due to malignant changes in a simple papilloma, which itself may be traced to inflammatory disease. The case reported by Kaltenbach[4] and the first case of Fabricius[5] possibly belong to this group.

Only a brief history of the present case could be obtained, and is as follows:

Case No. 576, aged 63. Admitted to Dr. Kelly's private sanatorium March, 1898. Complaint, sanious vaginal discharge, elevation of temperature.

The patient had had four normal labors and had enjoyed perfect health until the summer before admission, when she suffered from an attack of typhoid fever, after which she noticed an almost constant blood-tinged vaginal discharge, and was subject to frequent rises of temperature. Examination under an anesthetic revealed an irregular mass about the size of a mandarin on the left side of the uterus. The tumor was of rather soft consistency and was adherent. The right tube and ovary were apparently normal. The uterus was small and on curetting no tissue was removed. Pyosalpinx was diagnosticated and operation advised.

Operation.—Abdominal hysterectomy, right salpingectomy, left salpingo-oophorectomy. The right ovary, which was small and perfectly normal, was left in situ. The uterus, right tube and left tubo-ovarian mass were removed without difficulty, but in separating some widespread adhesions which surrounded the mass on the left side, the sigmoid was at one point torn through to the mucosa. This rent was repaired with a mattress suture of catgut.

The patient made an uneventful recovery.

Gyn. Path. No. 2376. The specimen consists of the uterus, the right tube and a left tubo-ovarian mass. The uterus is small and free from adhesions. Its mucosa is from

[1] Orthmann: Zeitschrift für Geburtsh. u. Gyn. Bd. xv, 1888.

[2] Friedenheim: Berliner klin. Woch., No. 25, 1899.

[3] Doran: A System of Medicine, Albutt & Playfair. Trans. of the London Obstet. Soc., vol. xl, 1898.

[4] Kaltenbach: Centralblatt, f. Gyn., 1889, p. 74.

[5] Fabricius: Wiener klin. Woch., 1899, No. 49.

one to two millimetres thick, and apart from a slight superficial injection, appears normal. The right tube presents a few light adhesions, but is otherwise normal.

The uterine end of the left tube for a distance of three centimetres is moderately dilated and cystic, averaging about one centimetre in thickness. It then suddenly expands into a large cylindrical mass eleven centimetres long, three and one-half centimetres in diameter. This mass is of a pinkish or grayish color, covered with adhesions and somewhat yielding to the touch. The fimbriated end of the tube is firmly bound down to the ovary. The ovary is 5 x 4 x 3.5 centimetres in size and contains cysts from one to two centimetres in diameter. It is also enveloped in adhesions. The broad ligament is thickened and infiltrated. On cutting open the tube in its long axis a greatly distended canal is found, which is filled with a granular friable mass. This is not attached on all sides, but springs chiefly from the outer third and under surface of the tube, and the remainder of the tube wall forms a thin smooth capsule around the mass. On closer examination of the tumor it is found to consist of finely branched papillary outgrowths which, to a great extent, have coalesced, forming a more or less homogeneous mass.

The fimbriated end of the tube has been replaced by the neoplasm, and from it a papillary excrescence projects into a small cyst cavity in the ovary.

Histological examination.—The uterus and right tube are normal.

Sections from the margins of the tumor occupying the left tube show in the earliest portions some swelling of the epithelial cells and a tendency to become heaped up into little folds. Further on we see branching papillary outgrowths having a stroma composed of vascular connective tissue and covered with several layers of epithelium. In the multiplication of the epithelium, small gland-like spaces have here and there been enclosed. In most places the epithelial proliferation has been so great that the papillary outgrowths have become fused and the sections present masses of epithelium containing round and oval gland-like spaces, while scattered here and there throughout the field are longitudinal and transverse sections of stems of stroma (Fig. 2).

The epithelial cells on the whole are fairly uniform in size. The deepest layer is composed of low columnar cells, while the superimposed cells are polymorphous, becoming flatter on the surface. The gland-like inclusions are lined with cuboidal or flattened cells. The nuclei are large, oval or round, and have taken a somewhat deep diffuse stain. Mitotic figures are numerous and show various irregular forms. In favorable sections the papillary masses are seen to spring directly from the inner surface of the tube wall, corresponding to the folds of the mucosa; and at one or two points normal folds may be traced for a short distance, then merge into the tumor. In places the growth extends a short distance into the muscular coat in the form of solid nests of epithelium, or as small glands lined with one or more layers of cells (Fig. 3).

The portion of the tube invaded by the growth in places shows considerable leucocytic infiltration, and the advancing margin of the tumor is generally bounded by a zone of round cells. The remainder of the tube is practically free from infiltration and presents no evidence of an old inflammation. The growth has invaded the ovarian stroma immediately adjacent, and the cyst-like spaces with which the tube communicates are lined in part with two or three layers of tumor cells. The other small cysts are merely dilated follicles and the stroma is normal. This tumor resembles in its finer structure the carcinomata of the uterine body, although its papillary formation is somewhat more distinctive than in most tumors of the uterus. This may be attributed to the fact that in the tube the outgrowths spring from the branched folds of the mucosa. On the other hand, inasmuch as glands are not normally found in the tubal mucosa and the glands invading the stroma are therefore entirely due to dipping down of the surface epithelium, the invasion is apt to be less general than in carcinoma of the uterus.

That this tumor is primarily tubal is evident in view of the following facts: ,

(1) The uterus is normal.

(2) The tube is large as compared with the ovary: ovarian carcinomata grow rapidly and attain considerable size before extension occurs.

(3) There is a definite relation between the papillary masses and the tubal folds, while the ovary merely shows invasion of parts adjacent to the tube and contains no papillary excrescences, excepting those projecting from the end of the tube.

(4) The mucosa of the tube is the site of the neoplasm, the invasion of the musculature being due to extension outward from the mucosa. In carcinoma of the tube, secondary to the ovary, the growth usually extends from the peritoneal coat inward and the canal may be normal or constricted, not dilated.

For more than a year after the operation the patient enjoyed excellent health. Then, however, she began to suffer from a feeling of discomfort in the lower abdomen, and as this persisted, an exploratory section was made in April, 1900, about two years after the first operation. A small oval mass about the size of an olive was found at the base of the left broad ligament, and a nodule the size of a small bean on the posterior surface of the bladder. These were dissected out, but several minute deposits infiltrating the pelvic peritoneum could not be removed. On histological examination the nodules removed proved to have the same structure as the primary growth. At the present time, a year after the second operation, the patient appears to be in good health.

Symptomatology.—The earliest manifestation of the presence of the disease is usually, a watery vaginal discharge, later becoming sanious. Hemorrhage is a variable sign: in five cases there was metrorrhagia, and in two others the menstrual flow was increased. Pain was present in the majority of cases, sometimes occurring before the appearance of the vaginal discharge, but more often later, and

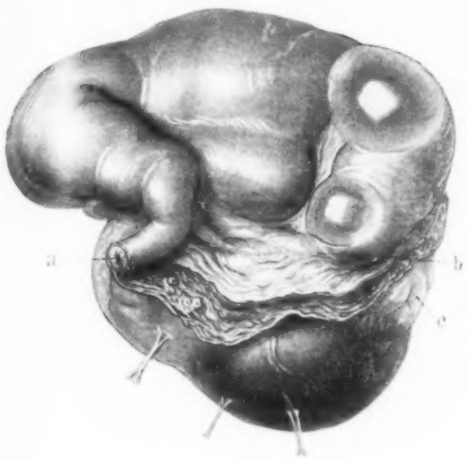

FIG. 1.—PRIMARY CARCINOMA OF THE TUBE. (Natural size.)—*a* is the proximal end of the tube and *b* the occluded fimbriated extremity. Near the uterus the tube is nearly normal in size, but rapidly enlarges until near the fimbriated extremity, it is 3 centimetres in diameter. At *c* are two subperitoneal cysts. The ovary *c*, contains a small cyst with dark colored walls. Attached to the under surface of the ovary are several adhesions.

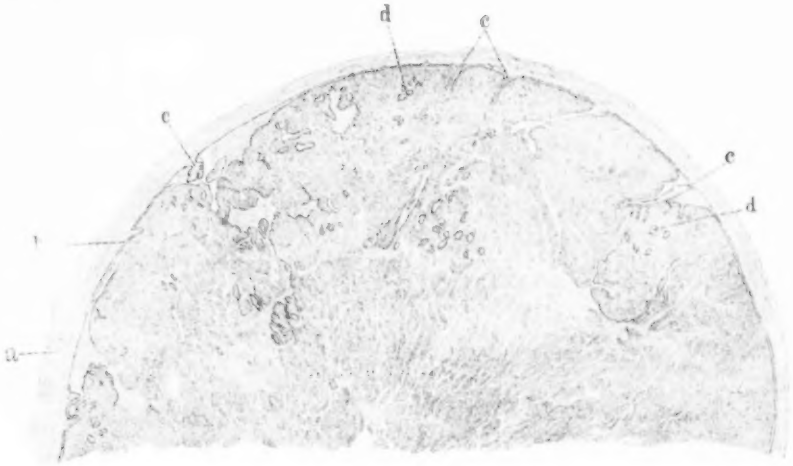

FIG. 2. TRANSVERSE SECTION THROUGH UPPER HALF OF THE CARCINOMATOUS TUBE. (6 diameters.)—The tube is fully five times its normal size. The wall, as represented by *a*, apart from being somewhat thinned out, is unaltered. *b* indicates the inner lining composed of one layer of cylindrical epithelium, in places somewhat flattened. The remnants of the bases of the folds are indicated by *c*. The lumen of the tube as indicated by the dark shade is completely filled with epithelial cells of the new growth. In many places these form a homogeneous mass, but at the points indicated by *d* assume a glandular arrangement.

FIG. 3.—ADENO CARCINOMA OF THE FALLOPIAN TUBE. (80 diameters.) The section is taken from the wall of the tube. *a* is the somewhat flattened but normal tubal epithelium. *b* a cross section of a normal fold and *c* the normal lining of a portion of a diverticulum from the lumen. Penetrating the wall of the tube and occupying nearly half of the field is carcinomatous tissue. The cells on the whole have fairly uniform nuclei, but here and there they are deeply stained and increased in size. At several points, especially in areas indicatedby *d*, a distinct gland-like arrangement is demonstrable. Along the advancing margin of the growth there is considerable round cell infiltration, especially evident at *e*.

in some instances was only noticed a few weeks before the time of operation.

In the two cases reported by Roberts[6] the patients experienced severe attacks of pain, followed by a profuse serous discharge with subsidence of the pain. These attacks occurred at intervals of about three months until operation was undertaken about a year after the first. Routier's[7] patient gave a history of a similar attack. The presence of ascitic fluid was observed in only a few instances.

Age.—With four exceptions the disease appeared in the fifth or sixth decade. The youngest patient was thirty-five years of age, the oldest seventy years.

Number of pregnancies.—As will be seen in the following table, absolute or relative sterility was noticed in almost all cases. Data regarding the number of pregnancies were obtained in twenty-four cases. Two other patients were unmarried.

9	patients	had	no	children.
2	"	"	"	but one miscarriage each.
7	"	"	1	child each.
2	"	"	2	children each.
3	"	"	3	" "

Diagnosis.—Carcinoma of the tube has not been diagnosticated previous to operation, a diagnosis of ovarian cyst or of hydro- or pyosalpinx, having usually been made. The sudden onset of a serous or hemorrhagic vaginal discharge at or about the time of the menopause, and following a long period of sterility, at once suggests a new growth, as inflammatory disease usually becomes manifest in earlier life. If a pelvic examination reveals a mass in one or both fornices, and if the uterus is free from disease, there is probably a new growth of the ovary or tube.

Ovarian tumors are less often accompanied by a vaginal discharge and usually attain a greater size before giving rise to symptoms. The differential diagnosis however is sometimes impossible.

In determining whether we are dealing with an innocent papilloma or with a malignant tumor, the histological structure is chiefly to be considered. The simple papillomata present a branched stem of connective tissue, invested with a single layer of epithelial cells of uniform appearance, and not tending to invade the stroma. In the carcinomata the epithelial cells are polymorphous, are usually in several layers, and exhibit a tendency to invade surrounding structures. The papillomata, however, are always to be regarded with suspicion, as is shown in the cases of Kaltenbach and Fabricius referred to above In these the histological picture was that of an innocent tumor, but in each there was a recurrence.

The thin walls of the tube and its intimate relation to the broad ligaments favor extension of the growth beyond the limits of the tube. It is essential, therefore, when removing the tube to make a wide dissection of the pelvic connective tissue. It is advisable to remove the opposite tube also, as in twenty-five percent of the cases reported both tubes were affected, and in three or four others carcinoma developed later in the tube, which, as it appeared normal at the time of operation, had not been removed.

The prognosis, so far as can be determined from the small number of cases, is less favorable than in carcinoma of the body of the uterus. We find that three patients died as a result of the operation. In fourteen cases recurrence was noted in from two to eighteen months. Three were apparently well fourteen months, nineteen months and seven years later, respectively. The remaining cases were either lost sight of or were reported too early to furnish data as to ultimate results.

In the March number of the BULLETIN (after the above article had been sent to the publishers) a case of carcinoma of the tube was described by Dr. Le Count. The author emphasizes the importance of chronic inflammation as an etiological factor, comparing carcinoma of the tube to similar lesions following hyperplastic inflammation in other organs. I must, however, take exception to the writer's criticism of many of the cases previously reported. Most of these cases are carefully described in the original, and both the descriptions and illustrations clearly indicate the presence of carcinoma. For example, in the case reported by Fearne from Leopold's laboratory, Le Count apparently considers the growth to be a simple polypous hyperplasia. I have, however, had the opportunity of examining sections under the microscope and agree with Dr. Fearne's diagnosis.

In regard to the adeno-carcinoma of the uterus described by Cullen in his recent book, which Le Count declares is merely a case of polypous hyperplasia, it is evident that the latter writer has not studied the case carefully, as from the description it is seen that many portions of the growth show the typical picture of adeno-carcinoma. I have personally studied the case carefully and there is not a doubt as to its being a glandular carcinoma.

[6] Roberts: Trans. Obstet. Soc., xl, 1899.

[7] Routier: Ann. de gyn. et obstet., vol. xxxix, 1893, p. 39.

THE JOHNS HOPKINS HOSPITAL BULLETIN.

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LIPO-MYOMA OF THE UTERUS.*

By J. H. Mason Knox, Jr., Ph. D., M. D.

Clinical Assistant in Gynecology, The Johns Hopkins Hospital Dispensary.

Although fatty tumors are frequently found in many parts of the body, the presence in the uterus of a new growth, consisting in large part of adipose tissue is so rare as to lend some interest to the report of the following case:

The patient was a woman, aged 62, married, and the mother of thirteen children, the youngest 24 years of age. The labors had all been natural. She had had three miscarriages, the last twenty-six years before. Her menstrual history had been perfectly regular and normal. The menopause occurred twelve years previously. The family and personal history was excellent. She had always been in good health. The first indication of any abnormality occurred nine years ago, when the patient noticed a slight serous vaginal discharge. This passed away after some weeks and did not affect her general health. The discharge returned after an interval of over eight years, but again lasted but a short time, and was accompanied by no untoward symptoms. For two weeks before examination she had been bleeding moderately, but continuously. The discharge has never been offensive. On only one occasion did the patient suffer when she complained of a sharp pain like that during labor. Her appetite was good and the bowels were regular. There was slight increased frequency of micturition. The patient thought that she had gradually lost in weight. The heart and lungs were normal.

On abdominal and vaginal examination a large firm tumor was found connected with the uterus, filling the pelvis and extending almost to the umbilicus. Operation was advised and performed by Dr. H. A. Kelly and a large mass, including the uterus and appendages, was removed by the supravaginal route. The tumor was not densely adherent, and the operation presented no unusual difficulties, except for rather free hæmorrhage, which was finally perfectly controlled. The patient made a slow but satisfactory recovery and is at present, eighteen months after the operation, in fair health.

During the operation and indeed for some time afterward there was no suspicion that the mass did not consist of a simple large myomatous uterus. It was only in the routine examination of the specimen in the laboratory that its unusual structure was discovered. Hence it is to the pathological description that most interest attaches.

Pathological description (Gyn. Path. No. 3703).—The specimen consists of a uterus involved in a large tumor, both Fallopian tubes, a portion of the left ovary, and a cystic right ovary. The uterine mass is globular in form, regular in outline and approximately 15 cm. in length, 14 cm. in breadth and 18 cm. in its antero-posterior diameter. The surfaces are generally smoothly covered by peritoneum. On the left side, however, above the attachment of the tube, the surface is roughened by numerous tags of adhesions. The tumor is firm and resilient in consistency. The uterine cavity is about 14 cm. in length. The mucosa of the anterior wall is glistening and is hardly 1 mm. in thickness. It is everywhere intact. That covering the posterior wall is much altered on account of the tumor which projects into it from behind. In some places many minute cysts are scattered throughout the mucous membrane, some of them being 2 mm. in diameter. In the uper part of the cavity is an area 4 x 4 cm., irregular in outline, sharply defined and very pale in color. At this point the mucosa is excessively thin and the tumor in the posterior wall almost comes in direct contact with the uterine cavity. In the lower part of the cavity is another pale area 9 x 9 cm. Here the mucosa is also thinned out but at numerous points it is still preserved, as witnessed by the small cyst-like spaces—dilated uterine glands. Situated in the upper part of the cavity is a sessile polypoid thickening 5 x 2½ cm. Here the mucosa varies from 1-7 mm. in thickness; some of the glands here are 1.5 mm. in diameter. The anterior uterine wall varies from .8 to 1 cm. in thickness and presents no abnormality. Occupying the posterior wall is a tumor mass somewhat globular in form (Fig. 1). It is approximately 10 x 13 x 10 cm. in size. On section the tumor to casual examination presents the appearance of myoma, but on more careful scrutiny is found to be markedly different. Traversing it in all directions are glistening bands between which are yellow soft looking areas. On scraping the cut surface distinct oil globules can be brought away, a thing that is never possible when an ordinary myoma is examined. The tumor itself presents no areas of breaking down. It is sharply defined from the surrounding uterine muscle, which varies from 3-5 mm. in thickness. At the point where the mucosa is pale-staining the tumor encroaches upon the uterine cavity to a marked extent and the mucosa here shows much atrophy.

Appendages.—On the right side the Fallopian tube is approximately 12 cm. in length, normal in consistency, and presents a uniform diameter of about 4 mm. Its surface is everywhere roughened and the fimbriated extremity is densely adherent to and occluded by the large ovary about to be described.

The ovary is converted into a lobulated mass, partly cystic, partly firm. The mass is somewhat bean shaped in outline and measures 8 x 5 x 4 cm. The inner pole is quite hard in consistency and on section is seen to be made up of dense fibrous tissue.

The harder portion merges into a small multilocular cyst which has a smooth, glistening surface with thin walls, and contains an iridescent yellowish fluid.

The cystic portion is divided into loculæ of various shapes and sizes by firm trabeculæ.

The several small pedunculated masses project into the cavity of the cyst.

*Read before the Johns Hopkins Hospital Medical Society, March 18, 1901.

The left side: Tube presents practically the same appearances as the right side. No induration; the surface is everywhere roughened, but a vestige of ovarian tissue remains in the broad ligament.

Microscopical description.—On microscopical examination the round tumor mass is found to be made up of large fat cells enclosed in a supporting substance composed of smooth muscle and connective tissue in varying proportions. The fat cells are generally round or oval, occasionally polygonal or irregular in outline from pressure upon each other. They vary in size from 5 to 15 times the diameter of a red blood corpuscle and appear, after hardening by the usual processes in which the fat is dissolved, like clear spaces (Fig. 2). The nuclei of these cells can frequently be made out as oval or rod-shaped bodies pushed to the periphery and often situated in an angle between several of the cells. The tumor is coursed throughout its extent by numerous bands of firm fibrous tissue which produce the lobulated appearance noticed in the gross specimen. This more solid material consists of round and spindle cells of the connective tissue type, having finely granular protoplasm and oval or spindle-shaped deeply-staining nuclei, together with a considerable quantity of intercellular substance. Intimately mingled with it in many parts of the growth are the longer cells of the smooth muscle type with rod-shaped, often wavy, nuclei. Considerable areas made up of connective and muscle tissue and containing no fat cells are met with throughout the tumor. The bulk of the tumor, however, is composed of groups of fat cells surrounded by irregular coarse bands of this firmer tissue. From larger bundles small filaments are given off which encircle the individual cells. These finest filaments apparently fuse with the cell walls so that numerous cell groups are met with in which the large globular fat cells appear to be in direct contact. In the larger bands of the supporting tissue are many larger blood-vessels, and numerous capillaries are present in the smaller septa. Many cells containing coarsely granular protoplasm, staining in eosin and having irregular deeply-staining nuclei (eosinophiles), are met with throughout the specimen, more particularly about the blood-vessels in the central portion of the tumor. Another form common in the growth are large round oval cells with a somewhat refractive protoplasm and rather palely staining nuclei. The cells of this variety, probably Mastzellen, are found between the processes of the connective-tissue cells. Nowhere in the specimen are fat droplets seen inside of either muscle or connective-tissue cells; that is to say, there is no evidence whatever of fatty degeneration. Occasionally more or less extensive areas are met with which stain homogeneously with eosin and are devoid of nuclei. These are areas of hyaline degeneration. The structure of the tumor is not materially altered as one approaches the periphery. The muscle tissue like that usually found in the uterine wall forms the immediate boundary of the mass on all sides, thus showing that the growth must have been interstitial in origin. In general, it may be said that the tumor is rather sharply demarcated from the surrounding tissue. In many places, however, the muscle near the growth contains here and there scattered fat cells, and occasionally groups of them in the muscle render the transition to the tumor proper a more gradual one. The muscle cells themselves present no abnormalities. Where the pressure of the growth is most marked they are often arranged in rows parallel to the circumference of the tumor. Numerous blood and lymph vessels are present throughout the uterine wall. Here, too, there is no evidence of fatty degeneration. Beyond the upper and lower limits of the tumor the muscle wall is much thicker. This is particularly true inferiorly in the portion corresponding to the cervix where it is over 1 cm. in diameter and composed of irregularly arranged dense muscle bundles. As one ascends, however, over the protruding anterior face of the tumor the muscle bands become rapidly thin, frayed, and often difficult to distinguish from the connective tissue of the mucosa. Areas of hyaline degeneration are not infrequent in the muscle wall, particularly near the tumor. The uterine mucosa presents a varied picture. For the most part it is much reduced in thickness. The surface epithelium over the tumor is preserved in protected areas, where it consists of a single layer of low cylindrical ciliated cells. The stroma is rather dense and made up of the usual round and oval cells with darkly staining nuclei, and a considerable amount of finely granular intercellular substance. The uterine glands are exceedingly few in number throughout most of the mucosa. When found they consist of small irregular or simple tubules lined by cylindrical epithelium. They are situated for the most part quite near the surface. The mucosa which does not cover the projecting growth is also thinned. Here, however, many small uterine glands are present and the stroma is proportionally more cellular. The polypoid thickness (sessile polyp) is made up of loose connective tissue, consisting largely of round and oval cells. Scattered all through this area are numerous glands varying from simple tubules to cysts of considerable size. The former are lined by high cylindrical epithelium one cell in thickness. The epithelium of the more dilated tubules is lower, while the cells lining the larger cysts are cuboidal in type. Many dilated capillaries are present in this raised area, which thus presents the usual structure of uterine polyp.

Appendages.—Right side; tube. Sections taken at several points along its course fail to present any abnormalities in the structure of the tube. Near the cornu the epithelium lining the lumen is slightly wavy in outline, while toward the fimbriated extremity the mucosa is gathered into intricate folds and convolutions. The stroma and muscle layers appear normal. The outer surface of the tube is markedly roughened, as though torn away from adhesions.

Ovary.—The solid portion of the enlarged right ovary is made up of a rather cellular connective tissue, the cells are oval or fusiform, have deeply staining nuclei and are separated from each other by a large amount of finely granular protoplasm.

The walls of the multilocular cyst occupying the outer pole of the ovary are composed of a thin framework of con-

nective tissue lined by epithelium usually one layer in thickness, the cells varying in outline from a very low cuboidal to a high cylindrical type, according to the amount of pressure.

The small pedunculated masses projecting from the cyst wall into the lumen consist of a fibrous stalk covered by epithelium similar to that lining the remainder of the cyst. In several areas the epithelium appears to be more than one layer in thickness.

Left side; tube. Sections of the tube near the uterus and toward the fimbriæ present the same appearances as those noticed in the right tube. The outer surface is likewise roughened.

Ovary.—But a small bit of the left ovarian tissue was found in the specimen. This is senile in type and made up of stroma cells rather closely packed together. No Graaffian follicles are seen. There are in places through the section coarse wavy bands of hyaline material, probably the remains of ruptured follicles. A few corpora fibrosa are present. At one point is a gland-like space nearly 1 mm. in diameter. This is lined by cells almost flat and containing oval deeply staining nuclei. At the opposite pole, possibly near the hilum, is a large amount of unstriped muscle fibre.

Consideration of the above findings leads to the conclusion that one is dealing with an actual new growth in the uterine wall composed of adipose tissue, the cells of which individually or in groups are surrounded by a marked increase in the smooth muscle and fibrous tissue elements in the proportion frequently found in so-called myoma uteri. The fact that no fat droplets are present in the cells of the firmer tissues and the absence of areas of softening in the tumor preclude the possibility that the condition may be due to a fatty degeneration, and suggests the unusual diagnosis of *lipo-myoma of the uterus* as being most properly descriptive of the specimen. That the right ovary is the seat of a small fibrous growth and a multilocular cyst, has of course no association with uterine tumor.

An examination of the literature at hand shows that but few, if any, cases of an exactly similar nature have been reported. As is well known, various degenerations of myomatous uteri are not uncommon and may be of such marked grade as to occupy a large part of the tumor.[1] Several cases have been recorded, chiefly by older writers, of tumors of the uterus which consisted of more or less homogeneous whitish or yellowish material, described variously as "Pure white fat,"[2] "Hard white fat insoluble in alkalies at boiling heat,"[3] "Yellowish white glistening substance, containing crystals of cholestrian."[4]

These tumors, called by the authors "steomata," "insteomata" or "cholesteomata," respectively, are likewise instances of degeneration and are not primary growths.

Meckel[5] speaks of a tumor, involving the uterus described by Lobstein.[6] The uterus was enlarged to the size of a seven or eight months' pregnancy by a "fatty tumor."

In 1853 Seegar[7] described a case which seems to resemble the one here reported. It is briefly as follows: A widow, aged 53, had for a year suffered from rather severe metrorrhagia, not relieved by any internal medication. On examination a round mass, the size of a child's head, bluish in color and elastic in consistency, was found protruding from the external genitalia and held by a pedicle surrounded by muscle fibres. The pedicle was ligated and the mass removed. The mass "*consisted of a fatty tumor covered by a firm cellular membrane and coursed by fibrous tissue bands. Parts of the tissue were rather soft, others firm and poor in blood-vessels.*" The patient made a good recovery. No microscopic description is given.

In 1861 T. Smith[8] presented to the Pathological Society of London a specimen removed by Mr. Paget from a woman aged 40. It consisted of a pedunculated mass the size of two fists united to the fundus uteri, but protruding between the labia. On section the tumor was made up largely of firm fibrous tissue but contained a small serous cyst and an "*adipose tumor, the size of a pigeon's egg, completely embedded in the substance of the larger tumor and surrounded by a fibro-cellular capsule, from which it was easily shelled out.*" No microscopical description is given.

A case of somewhat different nature was reported in 1880 by Schoinski.[9] On examining a woman, aged 28, who had been married seven years, to find if possible the cause of her sterility, he discovered on the anterior lip of the cervix a small movable tumor which on pressure could be easily forced into the os, closing it like a valve. This was excised and "proved to microscopical examination to be lipoma." The patient became pregnant three months afterward.

It is evident, therefore, that an adipose tumor of the uterus is an exceedingly rare condition. A lipoma in this situation is also of interest because, as there is no fatty tissue whatever present normally in the uterus, a lipoma of this organ lends support in a limited way to the theory of Cohnheim as to the histogenesis of tumors, namely, that they arise from some misplaced embryological element.

I take pleasure in expressing my thanks to Dr. Kelly for the privilege of reporting the case, and to Dr. T. S. Cullen for much assistance in the interpretation of the specimen.

Discussion.

Dr. Cullen.—I think this is a most interesting find. We have been making a systematic examination of all cases of

[1] Brunnings: Verhandlungen der Deutsche Gesellschaft für Gynaekologie, Bd. VIII, p. 348.

[2] Dressel, von Graefes und von Walthers, and Journal für Chirurgie und Augenheilkunde, 1853, Bd. XIX, p. 661.

[3] Dr. Wm. Bush. Edindurgh Medical and Surgical Journal, 1853, Vol. 79, p. 281.

[4] H. B. Allen: Australian Medical Journal, 1879; n. s., 1, p. 536.

[5] Handbuch der pathologische Anatomie, Vol. II, p. 311.

[6] Sur l' organisation de la matrice, Paris, 1803, No. 15, p. 8.

[7] Zeitschr. f. Wundaerzte und Geburtshülfe, 1853, Vol. V, p. 24.

[8] Transactions of the Pathological Society of London, 1861, Vol. 13, p. 148.

[9] Chicago Medical Review, 1880, Vol. 1, p. 469.

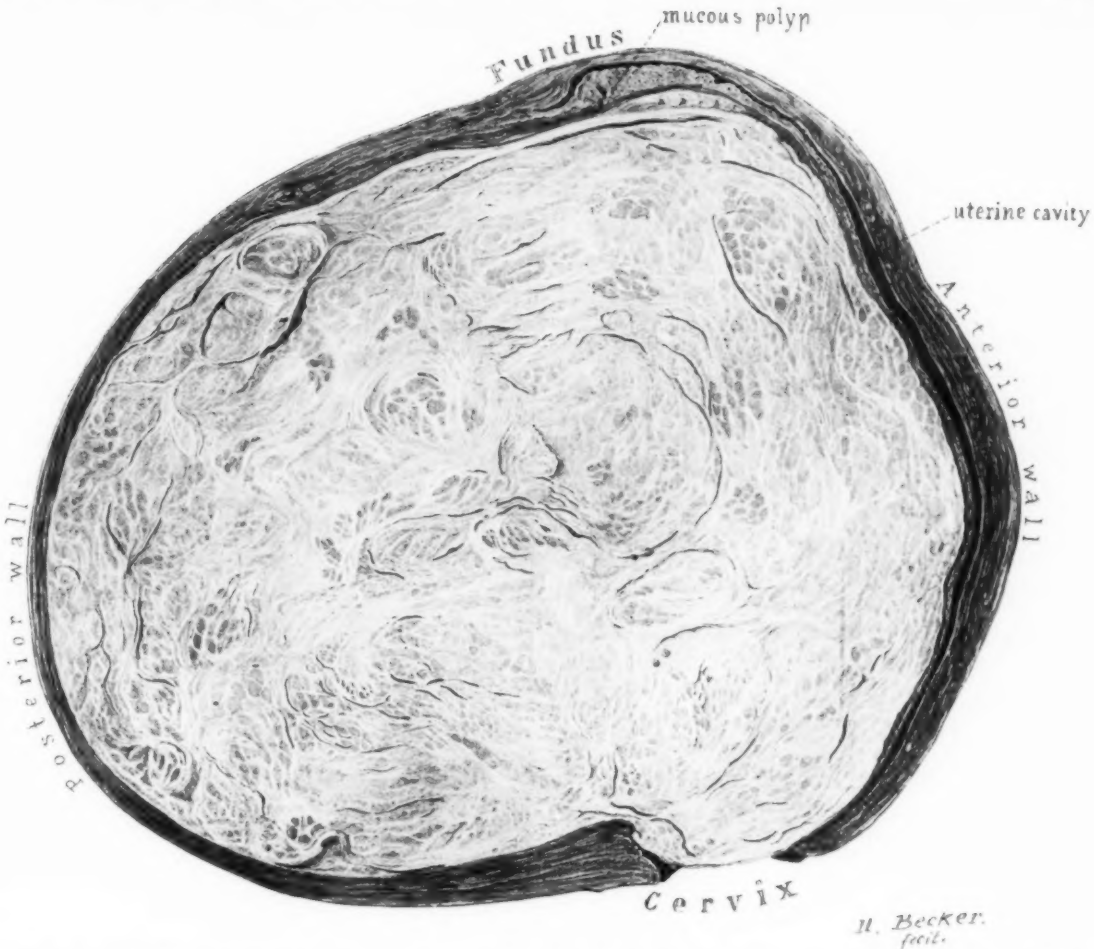

FIG. 1.—Lipo-myoma of the uterus, natural size. The uterus has been longitudinally bisected. The left half is shown. The posterior wall is seen to be the seat of a large globular tumor, presenting on cross section the irregularly lobulated appearance described. This is due to the inclosure of fat cells by trabeculæ of firmer tissue. The tumor is rather sharply demarcated from the surrounding uterine wall, which is everywhere thinned, the portion between the growth and the cavity being particularly affected. Near the superior limit of the cavity is a sessile uterine polyp seen in cross section.

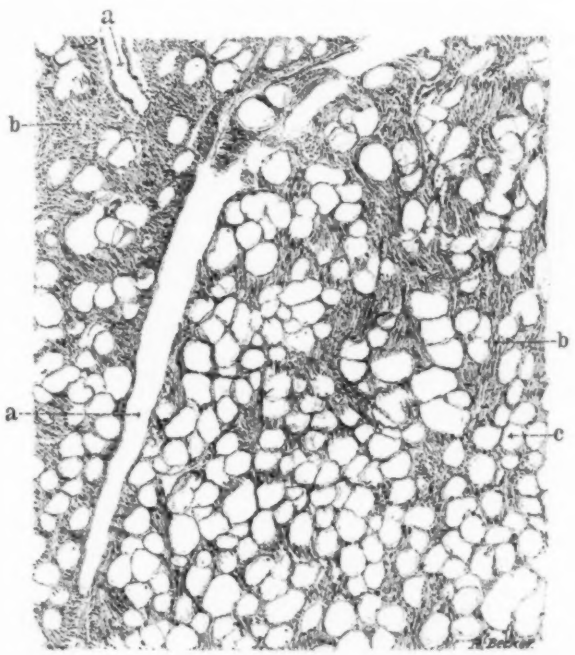

FIG. 2.—Lipo-myoma of the uterus (50 diameters). The section consists of a network, "b," composed of non-stripped muscle fibres and connective tissue in varying proportions. The interspaces, "c," are fat cells. At some points they are very abundant, at others isolated. "a" are blood vessels. Sections from all parts of the tumor present essentially the same appearances.

myomata and though over 600 specimens have been examined we have found but the one case of this character.

In nearly every myoma there is a hyaline degeneration in some part of the growth. This is usually diffuse, but in a certain percentage of the cases a large circumscribed area undergoes this degeneration. In the centre of such a block of hyaline tissue there is a gradual melting away, and we find nothing but a few threads of connective tissue and in the spaces between these free fat looking very much like melted butter. In this free fat cholesterin crystals are frequently present.

A problem that is attracting a great deal of attention at present is the degeneration that takes place in myomata. It has been a mooted question for some time as to whether or not myomata can become malignant. We have in the laboratory at present at least three specimens in which the centres of myomata contained sarcomatous tissue.

CHOREA WITH EMBOLISM OF CENTRAL ARTERY OF RETINA.

A SHORT REVIEW OF THE EMBOLIC THEORY OF CHOREA.

By Henry Thomas, M. D.,

Clinical Professor of Nervous Diseases, The Johns Hopkins University.

The subject of this communication is a young girl in apparently perfect health, except for slight choreic movements, which involve the right arm and leg, and very slightly the face. A closer examination shows, however, that she is suffering from the effects of an extremely rare and interesting complication of chorea, viz.: Embolism of the central artery of the retina. An abstract of the history, taken in the Neurological Dispensary of the Johns Hopkins Hospital, is as follows:

Dis. Nerv. System, No. 11,722.—Elizabeth C., age 16; sewing machine worker, was admitted to the dispensary Jan. 31, 1901, complaining of nervousness.

The *family history* is unimportant, except that one of her three brothers has had rheumatism, and that her mother, at the age of 51, is suffering from a facial tic of the left side. Other than this there is no history of any nervous disease in the family.

Personal History.—The patient is the fifth child of six; her birth was normal. She was healthy as a child, and developed normally. She had measles and whooping-cough, but no other infectious diseases and has never suffered from rheumatism. She began to menstruate at fourteen, and has since been regular.

For the last three years the patient has been working in a factory at a sewing-machine, which is run by power. She has been industrious and ambitious and her mother thinks that overwork may be accountable for her present trouble; at least neither mother nor daughter can think of any other possible cause.

Present Illness.—About six or seven weeks before she came to the hospital, an unsteadiness in the movements of her right hand attracted attention. This was noticed at table, and while the patient was at work in the factory. There was no change in her disposition, but a certain awkwardness developed in her speech. The movements also involved the legs on the right side.

The patient says that she has been unable to see with the left eye since the trouble began; but unfortunately she can give no definite account as to exactly when this blindness occurred. She says that it came on suddenly, and when she discovered the defect it was as complete as it is now. She also thinks that she was first conscious of it at about the time she began to be nervous. I have been unable to get a more definite history from the other members of the family.

Examination.—At the time of the first visit, the patient showed a mild grade of choreic movements which were limited to the right arm and leg, with occasional movements of the face. Speech was not noticeably affected. She was slightly anemic—hemoglobin being about 70%. Examination of the heart by Dr. Jacobs revealed a slightly dilated heart, with a rough blowing systolic murmur, heard at the apex.

Vision in the right eye was normal, but that in the left eye was absolutely nil. The right visual field was normal both to form and to colors. The ophthalmoscopic examination showed optic atrophy of the left optic nerve with markedly contracted arteries. The right optic nerve was normal. The pupils were equal, and were between 5 and 5½ mm. in diameter. In a dim light, however, the left pupil was slightly larger than the right. The right pupil reacted actively when light was thrown into that eye, but not at all when light was thrown into the left eye. The left pupil contracted when light was thrown into the right eye, but was immobile when the light was thrown into the left eye; that is, the right pupil reacted to direct light, but not consensually, whereas the left pupil reacted consensually but not directly. When the patient endeavored to fix an object brought close to the face, both eyes converged and both pupils contracted. When the right eye was closed the patient was unable to make the effort to accommodate with her left eye.

When first examined, it appeared that the left pupil dilated and contracted synchronously with the choreic jerks; upon the second visit, however, the right eye being bandaged and the left pupil being carefully watched, this observation

could not be confirmed. Nor was it possible to discover any choreic movements of the external muscles of the eye, although the ball showed the unsteadiness so often seen in blind eyes.

The case presented the typical picture of unilateral chorea of slight grade, with involvement of the optic nerve, and the probable diagnosis of embolism in the central artery was made, although at the time I did not recall having heard of any similar case. The patient was referred to Dr. Reik for ophthalmoscopic examination, and he has kindly made a careful examination, and will describe the condition which he found. He confirmed the diagnosis of embolism of the central artery of the retina.

The eye complications of chorea are not very numerous. Muscles of the eye-ball are at times, though rarely, the seat of choreic movements. Gowers[1] calls attention to the fact that the movements may be unequal in the two eyes, and so cause diplopia. This being transient, is not often complained of. The pupils have been described as dilated, and as reacting sluggishly or not at all to light. This statement which is an old one, has not been confirmed by later observers, who state that the pupils are usually normal in their size and action. Choreic movements of the iris, such as I at first thought were present in the case described above, have been described by Dr. H. B. Scheffield,[2] who observed in a choreic girl of 10 the most remarkable movements of the pupils. They would dilate as well as contract repeatedly within one minute. At times they were the size of a pinhead and at times they were dilated *ad maximum*. He confirmed the occurrence of these movements repeatedly during the attack of chorea. They disappeared when the patient recovered.

Gowers[3] refers to optic neuritis as not very uncommon. Usually slight. He says, however, that twice[4] he has seen it of such a high grade of intensity as to suggest the presence of a brain tumor. It subsides with the chorea.

Atrophy of the optic nerve is said to have been observed, and Schmidt-Rimpler[5] refers very briefly to such a case. These are probably cases following embolism of the retinal artery or are associated with some disease other than chorea.

Embolism of the central retinal artery is the complication which interests us particularly at this time. When referred to at all by the authors it is always spoken of as being extremely rare. Gowers, in his Medical Ophthalmology, says that there have been only two cases (Swanzy and Forster), and in his text-book he refers to only one—but this, a third case, that of Sym. Knies[6] speaks of the cases of Swanzy and Sym. Schmidt-Rumpler[7] has also no new cases to cite, and simply mentions these cases referred to by Gowers.

Swanzy,[8] besides his own case, gives references to the cases of Benson and Leber.

I have been unable to add very materially to this list in my somewhat hurried view of the literature. It was pointed out long ago by Trousseau, in his Clinical Lectures,[9] that impairment of sight had been observed by several authors, and he, himself, records a case. This impairment of sight, which he says, is probably due to paralysis of the retina is an accident excessively rare. The first well-reported case, as far as I have been able to find, was that of Swanzy, which is so generally referred to. On account of the great interest of these cases I shall give a short abstract of this case and of the others which I have collected.

Dr. Swanzy's Case.[10]—Lizzie, ———, age 10. Seen 16 days after onset. Patient noticed upon waking in the morning following a long day of sight-seeing that she could not see with the left eye. Choreic movements, more marked on the left side, made their appearance at about the same time. The ophthalmoscope revealed the typical picture of a recent embolism of the central artery. No heart lesion was found. Optic atrophy followed. The chorea disappeared.

Dr. Leber's Case.—I. H. Leber[11] says: "I have seen a single example of one-sided atrophy of the optic nerve in connection with chorea which was apparently due to embolism of the central artery. The patient was a girl eight years old, who had suffered from chorea for a number of years. The loss of sight had followed very suddenly a few months previous to the examination. Well-marked, one-sided atrophy of the nerve was found, the vessels being of very small caliber. Amblyopia Amaurotica existed. The second aortic sound was of an increased intensity, which only strengthened the theory of an embolic process being the causative factor in the optic atrophy.

Dr. Benson's Case.[12]—James Jackson, age 21. Rheumatic fever when 17; chorea at 18; recurrence when 19 and again when 20. When 21, the day before admission, he became progressively but quickly blind in the right eye; he could not see light. In about ten minutes the sight improved in the lower field. When examined, there was complete loss of the upper half of the right visual field. The ophthalmoscope showed the characteristic picture of embolism in the inferior division of the central artery. No lesion of the heart could be discovered. In 2 months the ophthalmoscopic picture was normal.

Dr. Ball's Case.[13]—Boy, age 15. Maternal grandmother

[1] Trans. Ophth. Soc. United Kingdom, 1884, iv, 306.

[2] Am. Med. and Surg. Bull. New York, 1896, vol. x, p. 373. "A case of Chorea Minor, involving also the ciliary muscles."

[3] Med. Ophthalmoscopy. Third edition, 1890, p. 198.

[4] In the second edition of his Diseases of the Nervous System, 1893, vol. ii, p. 604, he states that he has seen but one such case.

[5] Nothnagel Special Path., etc., 1898, vol. xxi, p. 46.

[6] Relations of diseases of the eye to general diseases. New York, 1895, p. 240.

[7] Loc. cit., p. 286.

[8] System of Diseases of the Eye. Norris and Oliver. 1900, vol. iv, p. 630.

[9] Bazire's Trans., p. 402.

[10] H. R. Swanzy, Ophthalmic Hospital Reports, vol. viii, p. 181.

[11] Graefe und Saemisch. Handbuch der Augenheilkunde, 1877, vol. v, p. 870.

[12] The Ophthalmoscopic Review, 1886, vol. v, p. 1.

[13] Transactions of Clinical Society of London, 1887–8, vol. xxi, p. 279.

and two brothers had rheumatism. Patient had not suffered from rheumatism. 1st attack of chorea 8 years before, since which he has never been quite free; worse for the six months before examination. Five days before he was seen, he noticed in the morning a darkness before the right eye; he could only see the upper part of objects with that eye. The fundus was normal with the exception of an arterial branch which was constricted, especially at its origin. There was haziness of the retina in the distribution and of the adjacent section of the optic disk. The apex of the heart was in its normal position, and there was a soft systolic apex bruit.

Dr. Sym's Case.[14]—G. S., boy, age 17. Had been well up to his seventh year, when he had chorea, which was not very severe. Was in the Infirmary and doing well; when walking one morning in the ward he felt a sudden mist come over the right eye. He has never seen out of it since. Examination showed left eye normal—right eye absolutely blind. In endeavoring to fix a near object, the right eye did not converge.

Right eye did not contract to light, but did so in sympathy to left. The right optic nerve was atrophied. There was a presystolic murmur and a reduplication of the second sound. In speaking of the rarity of these cases, Sym said that "Dr. Argyll Robertson informs me that a few years ago he saw a precisely similar case—that of a young lady in whom atrophy of one optic nerve succeeded a severe attack of chorea."

Förster's Case.—"The other case was recorded by Förster, but was not seen until some time after its occurrence. The patient, a child, had suffered from chorea for some years and during the chorea, had lost the sight of one eye. The disc was atrophied and the arteries very small."

Besides these cases, I have no doubt others could be found in which the embolism occurred at a late period in cases of chorea, followed by heart lesions. For instance, one of the cases pictured by Frost in his beautiful Atlas, "The Fundus Oculi,"[16] is that of a woman, 50 years old, who had had rheumatism when nine years old and several attacks of chorea between 11 and 15, rheumatic fever at 28 and again at 49, and embolism of the central artery at 50. But such cases can hardly be considered as complications of chorea.

Ophthalmologists are not in accord on the subject of embolism of the central artery, and a number of excellent observers believe that many of the cases classed under this head are examples of thrombosis. Their objection is that no source for the emboli can be found, while the causes which favor thrombosis are present. These objections can not be urged against the cases occurring in chorea, especially when there is a demonstrable lesion of the valves of the heart.

Not only do the authors who describe such cases consider them dependent upon emboli, but with hardly an exception they all point out the support which they lend to the theory of the embolic origin of chorea. Swanzy,[17] writing very lately, in reference to this point, says: "Possibly therefore the embolic theory of chorea may yet be found to be more tenable," at least for some cases of that affection, than Gower believes and Knies[18] is still more positive with the statement: "These two cases (Swanzy and Sym) demonstrate the development of chorea by multiple emboli; however this is not the sole cause of the disease."

The embolic theory of chorea is of great historical interest, and as it is so little referred to in modern text-books, a brief review may be of value.

The association of chorea with rheumatism and lesions of the heart was noticed in the 18th century, but particular attention was first drawn to it about the middle of the last century. Roger, in France, 1866, went so far as to state that rheumatism, chorea and endocarditis were all manifestations of the same poison. In England, where a great deal of attention had been paid to chorea and to this association, the relation between these conditions had received another explanation. Kirkes[19] advanced the theory that the relation was not between chorea and rheumatism but between chorea and valvular heart disease excited by rheumatism. He considered that chorea usually follows the heart disease, and he said: "And I now believe that whenever chorea occurs in association with acute rheumatism, the valves of the left side of the heart are inflamed and therefore the association is not between chorea and rheumatism but between chorea and valvular heart disease excited by rheumatism. . . . We can readily understand that the blood in such cases often previously unhealthy from rheumatic poison and now rendered still more impure by the introduction of inflammatory products and fibrinous particles from the diseased valves, is calculated to disturb very materially the functions of the various organs through which it circulates." Later he says: "Partly by the mere circulation of morbid blood through the nervous centers, partly also perhaps by temporary obstruction in the minute capillaries, occasioned by fibrinous particles arrested therein, the irritation leading to the development of chorea or other analogous phenomena may be accounted for."

About this time great interest was aroused in the physiology of the brain. Broca had demonstrated that speech was located in a definite part of the brain cortex. Hughlings Jackson had deduced from his clinical observations that there must be some sort of localization of the movements in the brain. The cortex had, as yet, not been proved to be excitable by electric stimuli, so it was thought that this localization of motion was to be looked for in the so-called sensory-motor ganglia, and particularly in or about the corpora striata. The fact that chorea so often affected the muscles of one side of the body, and that when it was bilaterial, it was usually unequal, pointed to the brain as being the seat of the

[14] Edinburgh Med. Jour., 1888, March, p. 811.

[15] Gowers Med. Ophthalmoscopy, p. 198.—I have been unable to trace it.

[16] London, 1896, pl. xii.

[17] Norris and Oliver's System, 1900, vol. iv.

[18] Loc. cit.

[19] Med. Times and Gazette, 1863, vol. i, pp. 636–662.

lesion, and Hughlings Jackson,[20] Broadbent,[21] Russell Reynolds, and others assumed that it was in or about the corpora striata that the primary seat of the disease was to be sought, and adopting Kirkes' view, they taught that multiple emboli were the most probable cause. This theory, supported by such men, carried great weight, but it was never generally accepted. For it was pointed out that in the cases of chorea which came to autopsy emboli could only rarely be demonstrated, and in cases where emboli were found after death, chorea had very seldom been present. Dickenson[22] gives most interesting data on this subject after detailing the anatomical findings is seven cases of chorea.

The embolic theory appeared, however, to receive a certain experimental confirmation from the work done by Money,[23] who succeeded in producing in the lower animals movements which could not be distinguished from those of chorea. He did this by introducing into the circulation minute particles that could be easily recognized by microscopical examination. He found that the choreic movements resulted only when the emboli lodged in the capillaries of the upper part of the cord. When the brain was the seat of the emboli, many other "forced movements," but not those of chorea. These experiments, he believed, demonstrated that choreic movements could be produced by capillary emboli, but he did not argue from them that human chorea depended upon a disease of the spinal cord. Against this there were too many well-known facts which spoke definitely for the brain being the seat of the process. He spoke of continuing these experiments upon monkeys, but of these I have seen no report. In the interesting discussion of Money's paper,[24] Hughlings Jackson, Broadbent and others took part. Hughlings Jackson and Broadbent referred to their former views and seemed to think that these experiments were to a certain extent confirmatory of them. Dickenson[25] again reviewed the subject in the light of Money's experiments, but was unable to find any confirmation for the embolic theory of chorea from the pathological reports of St. Georges Hospital and the Hospital for Sick Children.

This and similar investigations, as well as certain well-known clinical characteristics of chorea, spoke so strongly against the theory, that it was practically abandoned. Gowers speaks of it as of merely historical interest.

It is not my intention to speak in detail of the current theories that have been advanced in the endeavor to explain the etiology and symptoms of chorea. They will be found very fully discussed in the late monographs on the subject, especially the one by Wollenberg in Nothnagel's series.[26] But it may be of interest to point out that our views in regard to the localization of the morbid process upon which choreic movements depend, follow directly upon our physiological belief. This must be so, for, as yet, pathological examinations have given us no definite data. Hughlings Jackson, Broadbent and others placed the lesion in or near the corpora striata or optic thalami, for at that time it was believed that the movements of the body were coordinated in these structures. As our knowledge of the cortex increased, it was demonstrated that coordinate movements could be elicited by irritation applied to special areas of this structure and that the destruction of these areas caused paralysis of the movements. These most interesting discoveries directed the attention of the whole medical world towards the brain cortex almost, one is tempted to say, to the exclusion of the rest of the brain. Every disease in which abnormal muscular movements were a prominent feature was believed to depend upon some lesion of the motor cortex. Chorea was among the others, and at present the general opinion is that the wild movements of the disease depend upon some morbid process acting on the cortex. Of late, however, physiologists have been calling attention to the very important part that sensory impulses play in the production of coordinate movements, and to the extreme complexity of the mechanism underlying such movements. Destruction of many parts of the nervous system other than the so-called motor tracts causes marked disturbances. Ataxia, due to disease of the sensory spinal roots and of the sensory path within the central nervous system; experimental paralysis, caused by cutting the afferent roots of a limb; the forced movements and paralysis following destruction of parts of the cerebellum, may be mentioned as examples.

It is quite conceivable that an irritative lesion, or indeed, a destructive lesion, acting on some one or more of these structures might cause the involuntary incoordinate movements so characteristic of chorea. But at present the facts are too few to permit of anything more than a suggestion as to the direction in which the lesion is to be looked for. There are certain things that make it difficult to believe that it is a disease of the cortex, especially the motor cortex, that is responsible for the movements in chorea. That irritative lesions of this structure are followed by abnormal muscular movements, is one of the best established facts in pathology of the nervous system; but the movements which have been proved to follow lesions of the cortex are not at all like those seen in chorea, but follow the general type of epileptic convulsions; and, on the other hand, it is remarkable how very uncommon it is for such convulsions to occur in chorea, even in the most intense cases. In the slow systemic degeneration of the motor path, as it occurs in progressive central muscular atrophy (amyotrophic lateral sclerosis) incoordinate muscular movements, either voluntary or involuntary, are not present, the well-known fibrillary tremor being of quite a different character. In certain cases of hemiplegia and diplegia in children, movements develop which are, at times, quite like those seen in chorea, and this would seem to lend force to the belief in the central origin of chorea, or at least

[20] Edinburgh Med. Jour., October, 1868, p. 294. Med. Times and Gazette, 1869, March 6.

[21] Brit. Med. Jour., 1869, April 9, 345 and 369.

[22] Medico-Chir. Trans., London, 1876, p. 1.

[23] Med. and Chir. Trans., London, 1885, vol. lxviii, p. 277.

[24] Lancet, 1885, vol. i, p. 985, and in other journals.

[25] Lancet, 1886, vol. i, p. 10.

[26] Specielle Path. u. Therapie, Bd. xii, ii, Th. 3d Abth.

to the view that the motor path is involved. In some such cases, however, lesions have been found in the central ganglia, especially in the optic thalamus, and it is upon these that most authors believe that the post-paralytic chorea depends, and not upon lesions of the pyramidal tract.

Therefore, if these cases have any significance in explaining Sydenham's chorea, they point to some structure other than the motor cortex and the fibres leaving it, as being at the root of the trouble—possibly to the optic thalamus. One is tempted to assume, as did Hughlings Jackson and Broadbent long ago, although for quite different reasons, that the morbid agents underlying chorea act upon the central ganglia. Of the functions of the corpora striata practically nothing is known, but anatomical investigations make it seem very probable that in the optic thalami sensory or afferent impulses are rearranged before being distributed to the cortex. It is easy to imagine that a lesion here could so disarrange the afferent impulses passing through it that the voluntary movements depending upon these impulses would be incoordinate or, indeed, that involuntary incoordinate movements might result. But, as I said before, the anatomical basis which underlies coordinate muscular movements is extremely complex and is, as yet, but partially known. It therefore seems but of small value at the present time to advance any theory as to the seat of the morbid process of chorea.

I cannot resist the temptation, however, to express my conjecture that when the lesion is found, it will be on the afferent rather than on the efferent side of the motor mechanism.

In regard to the morbid agent, I have but little to say. The objection to the embolic theory seems so strong in the light of our present knowledge, that I do not see how it can be held. The cases of embolism in the central retinal artery during an attack of chorea demonstrate that such emboli are at times present in the circulation of choreic patients, which is no more than would be expected when we consider how common endocarditis is in association with this disease; but they cannot be made to prove that the disease depends upon emboli in some other part of the brain—indeed, what is strange is the great rarity of emboli of all kinds in chorea.

The belief which is common now differs but little from that held in the early part of the last century, when the relation between chorea and rheumatism was so strongly urged. It was then thought that joint affections, endocarditis and chorea were all different manifestations of the poison upon which inflammatory rheumatism depends. Now we would say that the poison is similar to the rheumatic poison and so avoid the definite statement that it is the same Wollenberg, who calls the disease infectious chorea, thinks that it practically always follows some form of rheumatic infection, and bears to this the same sort of relation that the paralysis following diphtheria does to the diphtheritic infection. He speaks of it as a meta-rheumatic process.

Discussion.[27]

Ophthalmoscopic Appearances.

Dr. Reik.—Through the kindness of Dr. Thomas I had the privilege of seeing this patient and the opportunity of sketching the ophthalmoscopic appearances. Perhaps a word in explanation of, and apology for, this colored sketch should be given before passing it around. The members of this Society are so accustomed to the artistic work of Brödel and Becker that one naturally hesitates to exhibit the efforts of an amateur. The endeavor to illustrate some of the main features of the ophthalmoscopic picture of this eye has, however, I hope, been sufficiently successful to serve its purpose of aiding you to understand the conditions described.

You will observe that the central retinal artery, as it emerges from the central canal is very small and its branches appear like fine red lines as they spread out in the retina. Their lumen has not been entirely obliterated, although the contraction has reduced them to almost capillary dimensions. The vessel walls are distinctly recognizable for a short distance beyond the disc margin by the delicate white lines bordering the narrowed red column. The superior, nasal and temporal branches can be traced quite to the periphery and, after passing the first subdivision, it is noticeable that they increase somewhat in size; possibly the result of anastomosis. The inferior nasal branch is lost about 3 or 4 mm. from the disc, being entirely invisible beyond that point.

The veins are somewhat smaller than normal and appear to be slightly smaller on the papilla than towards the periphery.

The optic disc shows a well marked atrophic condition and its sharply defined edges are surrounded by an irregular ring of choroidal pigment. The macular area is of deep red color and the fovea is seen as a bright, but very minute, yellowish spot. Between the macula and the disc, close to the former, is a narrow semicircle of hazy white retina, with several white dots to the temporal side. Pressure on the globe fails to produce either arterial or venous pulsations. The eye is absolutely blind. Taken in full the picture is a striking one and typical of an obstruction in the central artery of the retina.

The complete blindness which results suddenly from an obstruction of this vessel is said to be permanent even though the occlusion be but brief and be soon followed by a restored circulation. A few hours only suffices to bring about the functional death of the retina. If seen shortly after the embolism occurs the arteries are seen as narrow white bands, or as thin red lines on the disc, which are not visible far beyond its margin. Within a few hours the retina becomes generally hazy, and, in its thickest portion, between the disc and macula, of a denser fluffy-white character, the result of odema or possibly post-mortem changes. The macula itself appears of a deep red color in marked contrast to the pale surroundings. This has been said by some to be

[27] Meeting of the Johns Hopkins Hospital Medical Society, February 18, 1901.

due to hemorrhage, but it is more likely only the appearance of the deep red choroid seen through the retina at this point and contrasted with the pale fundus.

At a later stage the vessels again become visible and are seen to carry a thin stream of blood; the obstruction has either been incomplete, the embolus has shrunken and allows some blood to pass, or a collateral circulation has been established. It has been generally held that the retinal is a terminal artery and that anastomosis with the choroidal or ciliary systems is impossible. Leber was unable, by injection experiments, to demonstrate any connection between these systems and the establishment of a collateral circulation has never been proven *post-mortem*, still certain clinical evidences seem to support the view that it may occur. For instance, the arteries, as in this case, may appear larger in the periphery than towards the disc, and in some cases observed by Hirschberg and others, the blood current has been seen to move towards the disc. Such a collateral circulation can only come from the short ciliary arteries which sometimes send branches, the cilio-retinal arteries, to the temporal side of the disc, or from the long anterior ciliary vessels in the sclerotic and choroid. In this case there are no such vessels visible on or near the disc, but the distal parts of the superior retinal arteries do appear to be somewhat larger than their proximal ends.

Dr. Randolph.—I was much interested in Dr. Reik's description of this case, particularly in regard to the cherry-red spot in the neighborhood of the macula. I think the most reasonable explanation of it is to be found in the condition of the retina at that point. In the region of the macula lutea, the retina is thinner than anywhere else and we can easily understand that the red color of the choroid seen through this thinner area would be more emphasized at this point than elsewhere. This is the case in the normal eye. I think, as Dr. Reik said, that it could not be due to hemorrhage. One of the particular points of difference between embolism of the central artery and thrombosis of the central vein is the absence of hemorrhages in the former affection. In thrombosis hemorrhages are always seen. I think, then, the red spot is due to the thinner retinal tissue in this region and this color is of course much accentuated by the anemia of the surrounding retina.

Dr. Osler.—It is surprising that embolism does not occur oftener in chorea; perhaps there is no disease in which endocarditis occurs more frequently. Some 6 or 8 years ago I took the trouble to go over 73 comparatively recent autopsy reports in chorea cases, in 67 of which endocarditis was present and yet embolism is certainly rare. In one of the five autopsies in chorea I found a spot of embolic softening in the corpus striatum.

VOLVULUS OF MECKEL'S DIVERTICULUM WITH RECOVERY AFTER OPERATION.

By William J. Taylor, M. D., Philadelphia.

Attending Surgeon to St. Agnes' Hospital and to the Orthopedic Hospital and Infirmary for Nervous Diseases. Consulting Surgeon to the West Philadelphia Hospital for Women.

A little girl, aged six, was admitted to St. Agnes' Hospital late in the afternoon of Wednesday, April 11, 1900. The family history was negative, except that a brother had been operated upon for an acute appendicitis.

All her life long she has been subject to occasional attacks of abdominal pain which had always been relieved by a purgative. On April 9, 1900, she was seized with sudden and acute abdominal pain and was under the care of her family physician who was unable to open the bowel by ordinary measures. This condition persisted, and she was admitted to the hospital on the afternoon of April 11, forty-eight hours after the beginning of the attack. I saw her within an hour, when she had the appearance of being extremely ill with a temperature of over 100° F., intense pain and marked rigidity of the abdominal muscles, and a rapid and very weak pulse. Presuming from the history and her physical condition that I had to deal with an attack of acute appendicitis, and the rigidity of the abdominal wall being such that I could not make a careful examination, she was immediately etherized and the abdomen opened by a small incision in the right side. Introducing my finger, a tense rounded mass was perceived, filling the whole of the right side of the pelvis, resembling somewhat an enormously distended intestine, and upon enlarging the wound I could see a dark, almost black, ill-smelling mass. The intestines were so much distended that I was obliged to open the ileum at one place to get rid of a large amount of gas and liquid fæces before I could bring the intestines under control. This I consider a much safer proceeding than evisceration, especially in young children who bear such manipulations badly. I then enlarged the wound and, after some difficulty, delivered a dark-colored, almost gangrenous, cystic tumor, which upon careful investigation proved to be a Meckel's diverticulum, springing from the wall of the ileum farthest away from the mesentery and about fourteen inches from the cæcum. One inch from the intestine proper, the pedicle of the diverticulum had twisted upon itself three complete turns, thus cutting off the circulation and causing it to become gangrenous. The distended end of the diverticulum was about the shape of a potato with a pedicle not larger than a lead pencil at the point where the twisting occurred, and was entirely free in the

[1] Read before the Johns Hopkins Hospital Medical Society, February 18, 1901.

abdominal cavity, except at its point of attachment to the ileum. There was no evidence of a cord-like remains of the diverticulum nor of the omphalo-mesenteric vessels. There were no adhesions of any moment holding the cyst, if it can be so called, in place, but the whole of the pelvis was filled with it. The rough measurements of this mass were 3½ inches long by 2 inches wide. This small pedicle was grasped with a clamp forceps, and it was then cut away from the intestines through sound tissue, the wound invaginated, and closed with a double row of Lembert sutures. It was necessary to almost completely eviscerate the child before this mass could be delivered through the abdominal wound. The intestines were much congested and at several points were covered with patches of lymph and several coils were glued together by adhesions. The glands in the mesentery were

Photograph of Meckel's Diverticulum, natural size. Showing the pedicle grasped by clamp forceps.

enlarged and hard, several being the size of a lima bean, but the majority were not larger than a pea. In view of the gangrenous condition of the cyst, a small rubber drainage tube was introduced after free flushing of the abdominal cavity with a saline solution. The pedicle was so softened that in examining the diverticulum after its removal, its wall burst and quite an amount of its contents—which consisted of fluid fæces—escaped. This photograph taken by flash light was made within a few minutes after its removal and shows admirably both its size and appearance, although, owing to the escape of some of its contents, as I have just stated, the distension of its walls is not so great as at the time of its removal.

The greatest haste possible with accurate work was employed during the operation which produced profound shock. Reaction occurred very quickly, however, and convalescence was rapid and uneventful. She was discharged from the hospital at the end of three weeks.

This case was absolutely unique in my experience, as from the history, the symptoms, and the examination of the child before operation, I had no doubt but that my diagnosis of an acute appendicitis was correct, while she was too ill and her symptoms too urgent for any elaborate physical examination. At first I was utterly at a loss to explain the cystic mass which I could feel within the pelvis and, indeed, I suspected it to be an ovarian cyst which had become strangulated. The cause or mechanism by which the diverticulum became twisted upon itself is quite beyond my explanation, but it is possible that the peristaltic movements of the intestines may account for its occurrence.

In making a somewhat extended search of the literature of the subject of Meckel's diverticulum and its relations to intestinal strangulation, I can find no record of an exactly similar case. R. H. Fitz in his exhaustive study[2] does not record a similar instance, but J. W. Elliot[3] reports one very much like it, discovered in operating upon a supposed case of acute appendicitis. In this instance, the diverticulum was about seven inches long and of the diameter of the ileum, and had become twisted upon itself at the attachment to the gut and produced strangulation. This case recovered. J. A. Prince[4] records an instance of a child, aged four years, who had colic for three days, when by abdominal section a diverticulum was found of globular shape, one-quarter inch in diameter at its junction with the intestine, five-eighths of an inch in its greatest diameter, and ending in an elongated cord. Perforation had occurred. T. L. Kelynack[5] records a largely distended diverticulum, a specimen in the Pathological Museum of the Manchester Royal Infirmary. In 1446 subjects examined by him post-mortem, 18 examples of Meckel's diverticulum were found; this gives a proportion of 1 to 80, or about 1.25 per cent. It was more common in males than in females in the proportion of 11 to 7. The oldest of all these cases was 60, the youngest 13. In no instance was the presence of the diverticulum in any way connected with the cause of the death of the subject. The photograph which he shows in his article was from a patient, aged 42, who died of acute pneumonia. The diverticulum was connected with the ileum by a narrow mouth, ¾ of an inch wide, and then extending to a diameter of an inch and rapidly widening into a pouch almost as big as the cæcum. It had a diameter of 3¼ inches and a circumference of 10½ inches. It lay quite free in the abdomen and, possibly, its large size may have been due to distension by the intestinal contents. In no instance in all the 18 cases which he records was the lumen of the diverticulum continued to the umbilicus or the abdominal wall. In the Manchester Med. Chronicle

[2] Am. Jl. Med. Sc., July, 1884, p. 30.
[3] Boston M. & S. Jl., June 14, 1894, p. 586.
[4] Medical News, January 14, 1893, p. 45.
[5] Brit. Med. Jour., Aug. 21, 1897, p. 459.

(1896, p. 338), he mentions also an instance of a pendulous pear-shaped pouch, discovered after death from sarcoma of the thigh. Thomas Carwardine[6] reports a case of volvulus of Meckel's diverticulum occurring in a child two days old. The child had been repeatedly sick, bringing up a greenish-brown vomit and had passed nothing per anum, nor was there any discharge from the umbilicus. The distension appeared more on the left side and upon opening the abdomen, there were evidences of lymph upon the surface of the distended intestines from peritonitis and there were numerous adhesions. In making an artificial anus into a mass on the right side of the abdomen, a considerable quantity of meconium escaped. The child died in twenty-four hours, and upon post-mortem examination, it was found that a meconium-containing cyst had been opened, produced by volvulus of Meckel's diverticulum of some three turns. Only a small impervious cord connected it with the bowel below and a minute stalk, which would partially admit a bristle, attached it to the distended bowel above, the junction being a T-shaped one. The special point of interest in this case is the volvulus of the diverticulum occurring in late fœtal life in utero. Lionel Beale[7] describes a case of death due to perforation of a Meckel's diverticulum, fifteen inches from the cæcum. This was nearly three inches long, about the same diameter as the bowel at its origin but increased in size until it terminated in a cul-de-sac, being twice as broad at its lower part as at its origin. It contained a cherry stone and other foreign substances.

Numerous instances of strangulation of the bowel due to the diverticulum being attached to other organs and to the bands formed by the persistence of the omphalo-mesenteric vessels have been reported by D. P. Allen,[8] A. F. McGill,[9] C. R. Darnall,[10] and many others, while quite a few instances have been known of an intussusception having its origin in an invaginated Meckel's diverticulum, as in James Adams'[11] case and in those mentioned by Treves in his "Intestinal Obstructions," and by others. H. H. A. Beach[12] mentions an instance of pelvic tumor formed by a calcified Meckel's diverticulum uniting the ileum and the bladder.

I have purposely not gone into the anatomical and pathological details of these interesting cases, nor have I attempted to tabulate all those which have been reported, merely mentioning a few of those which have seemed to more nearly resemble my own. Fitz[13] mentions one case reported by Roth—I have not been able to consult the original reference—in a child a year and a half old, where the pedicle became twisted and hemorrhagic infiltration and necrosis of the mucous membrane occurred with acute peritonitis. He mentions also several instances of cyst connected with the intestine which undoubtedly originated as diverticula, and it is to this very elaborate paper I would refer as well as to Doctor Osler's paper in the Annals of Anatomy and Surgery, 1881, Vol. IV, and particularly to Frederick Kammerer's in the Annals of Surgery, August, 1897.

The cyst contained two grains of corn, two half peanuts and a fluid, greenish in color and of very foul odor.

Discussion.

Dr. Kelly.—Diseases of Meckel's diverticulum, apart from hernia, are certainly rare; in the course of several thousand abdominal sections I have never seen one pathological diverticulum. I am interested in this case particularly on account of the twisted pedicle, the occasion of operation; the torsion of abdominal organs or tumors is a subject still but indifferently understood.

There are undoubtedly a variety of factors which may operate to produce a change of position and hence sometimes of rotation of a body or viscus contained within the abdomen.

I think, further, that the subject of rotation should not be considered alone, but should rather be studied in connection with various other movements, especially those of accommodation or of adaptation of the contained structure to the space in which it is contained, then understanding the various movements which may be impressed upon all bodies we are better prepared in any particular case to explain the cause of the rotation. A lack of employing this wider method of analysis is manifest in the common mistake of trying to explain the rotation of all tumors by one rule often known by the name of an investigator. The following factors must be considered:

1. A growth of the tumor and a consequent change in size and form necessitating change of position.

2. Spontaneous movements on the part of the tumor, as in the case of the lump fetus.

3. Movements impressed upon the tumor by the surrounding hollow viscera or the growing uterus.

4. Movements impressed on the tumor by the contraction and relaxation of the abdominal parietes.

5. Movements resulting from translation or succussion of the body, as in walking, lying down and rising, ascending steps, etc.

The position of the body in the abdomen and the character of its pedicle are also factors of the utmost importance.

For example, a long thin pedicle which offers no resistance is best adapted for displacement as well as for the torsion of the body attached to its extremity. A short thick pedicle offers resistance and sessile bodies manifestly cannot be twisted at all.

A body attached somewhere at the periphery is less liable to displacement than one situated more centrally; it is for this reason all the heavier viscera are attached to the walls on all sides, while the intestine designed physiologically to enjoy a wide excursus of movement, is centrally placed with a mesentery which acts like a pedicle.

[6] Brit. Med. Jour., 1897, December 4, p. 1637.
[7] Path. Soc. Trans, vol. iii, p. 366. May 4, 1852.
[8] Med. News, Aug. 13, 1892, p. 177.
[9] Brit. Med. Jl., January 14, 1888, p. 72.
[10] N. Y. Med. Jl., January 12, 1901, p. 62.
[11] Brit. Med. Jour., April 9, 1892, p. 764.
[12] Annals of Surgery, October, 1896, p. 484.
[13] Am. Jl. Med. Sc., July, 1884.

Examples of rotation are oftenest found in ovarian tumors which do not conform to the physiological type of the viscera either in their location, for they soon grow out among the moving viscera, or in the nature of their attachment, which instead of being sessile is by a more or less attenuated pedicle. There are three important phases in the life history of an ovarian tumor in this connection; in the first place, as it grows it fills the posterior quadrant of the pelvis in which it lies, often pushing the uterus in the opposite direction; next it fills the whole posterior pelvis and projects up through the superior strait; finally, it ends by filling the abdomen more or less completely. While in the pelvis the tumor rarely rotates, as it is splinted on all sides by the pelvic walls, and the largest tumors rarely rotate as they, too, are splinted by the abdominal walls and are too heavy to be impressed by slight forces. I find that the larger cysts are oftener accommodated on the right side under the liver, and I attribute this to the repeated soft impacts of the alternately distending and contracting stomach.

The medium sized ovarian tumors are the ones oftenest twisted, and I consider two factors of great importance in this connection; one is the constant movements of the viscera now collapsed and now distended with food and gases, especially the movements of the stomach; the other is the nipping action of the linea alba on one side of the tumor or the other as it lies in one or other iliac fossa. As the abdominal walls contract the linea is brought nearer to the bodies of the vertebræ and the tumor is caught on one side and the tendency is to turn it.

It is well known that a large percentage of cases of twisted pedicles occur after a confinement; here a most interesting new factor steps in, and that is the sudden translation of the tumor drawn by the collapsed uterus into a new environment. Given an irregular body (tumor) lying within an irregular cavity (abdomen), and granted certain movements, the contained body will seek that position in the container which is best adapted to its form. It is during this period of readjustment after pregnancy that torsion occurs.

I have spoken in my second rule of spontaneous movements on the part of the tumor (living fetus) deciding its relation to the container (uterus), and this, I think, explains the reason for the position of the fetus in utero.

Dead fetuses offer a large percentage of breech presentations, and this is due to the fact that the relation of the living fetal ovoid to the uterus is not simply that of the actual physical measurement, as in the dead, but is the potential ovoid of the body plus the excursions of the feet. If we enlarge the caudal pole of body by adding the segments of circles described by the feet, we will then have a figure corresponding in form to the interior of the uterus distended with the normal amount of liquor amnii, and the reason of the usual inverted posture is evident.

Dr. Mitchell.—During the last year there has been in Dr. Halsted's service a case which might be of interest in connection with that of Dr. Taylor.

A boy, four years old, was admitted with a strangulated left inguinal hernia. The hernia had been present about a year. The patient was in good condition. On five or six previous occasions there had been difficulty in reduction, and the present strangulation had existed twenty-six hours, being accompanied by great pain, and for the past sixteen hours frequent vomiting. Operation was performed immediately under chloroform anæsthesia. In the hernial sac was found a loop of ileum 6 or 8 cm. from the cæcum, and by its side a Meckel's diverticulum, both being constricted at the external ring. The diverticulum was 5 cm. long, 2 cm. in diameter at its base, and 1 cm. in diameter at its tip. The distance of its point of origin from the cæcum was not determined. The cæcum and appendix were presenting just within the external ring. The diverticulum was excised, the bowel dropped back, and the radical operation for the cure of hernia performed. Recovery was uneventful.

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